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REPORT ON A TRANSPORTATION TEST WITH SWEET CHERRIES IN REFRIGERATOR CARS: INFLUENCE OF THE HEIGHT OF LOAD, MECHANICAL CIRCULATION OF AIR, AND THE USE OF CARBON DIOXIDE GAS AS A SUPPLEMENT TO STANDARD REFRIGERATION.

(In cooperation with Yakima Valley shippers, Northern Pacific, Chicago, Burlington & Quincy, and Erie Railroads, and New York receivers.)

From Yakima, Wash., to New York, N. Y., June 21 to July 1, 1942

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Report on a transportation test sweet cherri erator cars: Influence of the heig.. of load, mech culation of air and the use of carbon dioxide gas a ment to standard refrigeration.

INTRODUCTION

Prior to the season of 1941 shippers in the Pacific Northwest used e refrigerator cars for the shipment of sweet cherries whether movement wa passenger or freight service. Studies of carbon dioxide gas retentiveness of refrigerator cars used in commercial service during 1941, as discussed in H. T. & S. Report No. 75, raised the question whether better protection might not be secured in freight refrigerator cars of recent construction than in some of the older express refrigerator cars that were found to retain carbon dioxide gas very poorly. Another reason for testing freight refrigerator cars for sweet cherries was that war conditions made it impossible for shippers in some districts to obtain express refrigerators for freight movement during the season of 1942.

The principal objection that shippers had to using freight refrigerator cars for sweet cherries was that these cars are shorter than express refrigerator cars and it is correspondingly harder to refrigerate properly the top layers, because of the higher loading necessary to meet the minimum weight requirements. The length of an express refrigerator is such that a minimum carload of 27,500 lbs. may be accommodated through loading 27 stacks 7 high (35 inches) and 1 stack 8 high (40 inches) whereas in a freight car over half the load must be stacked 9 high (45 inches).

The recent acquisition by carriers of freight refrigerator cars equipped with fans for the mechanical circulation of the air within a car, through the ice and over the load, made the use of this equipment for high loads seem promising. It raised the question whether this accessory equipment might not result in better refrigeration of sweet cherries in 40 ft. freight cars than in the longer express cars of conventional design, and whether even heavier loads than that of the 27,500 lb. minimum weight might not be carried satisfactorily in the 40 ft. freight cars. If loads of 34,000 lbs. could be refrigerated satisfactorily, the result would be a more efficient use of railway equipment and a saving in transportation and refrigeration costs amounting to 3.6¢ per package.

The rather general use of solid carbon dioxide as a source of gas to supplement standard refrigeration in the shipment of sweet cherries also has a bearing on the shipment of higher and heavier loads. On the other hand should it be possible to maintain fairly uniform fruit temperatures between 32°and 36°F. during transit, through the mechanical circulation of air, the use of carbon dioxide gas might not be necessary.

OBJECT OF THE TEST

The object of the test was to obtain information on the transportation of sweet cherries in 40 ft. freight refrigerator cars with loads of 27,500 and 34,000

pounds under the supplementary protection of carbon dioxide gas and mechanical circulation of air, as compared with customary loads of 27,500 lbs. in 50 ft. express refrigerator cars, with and without gas.

OUTLINE OF TEST

To secure these comparisons studies were made on seven carloads of sweet cherries. Car specifications and loading data are given in tables 1 and 2.

A summary of the equipment and loads is as follows:

1. N.P. 92035 - 40 ft. freight car; fares; 34,020 lb. load. Without CO_2 gas.
2. N.P. 92140 - 40 ft. freight car; fares; 27,580 lb. load. do.
3. N.R.C. 147 - 50 ft. express car; 27,580 lb. load. do.
4. N.P. 93588 - 40 ft. freight car; 27,580 lb. load. With CO_2 gas.
5. N.P. 93154 - 40 ft. freight car; 34,020 lb. load. do.
6. N.R.C. 204 - 50 ft. express car; 27,720 lb. load. do.
7. N.P. 92069 - 40 ft. freight car; fans; 27,580 load. do.

Mechanical circulation of air.

The fan cars were all freight refrigerator cars equipped with "Preco" fans. The only deviation in general design from the standard freight car was in the construction of the floor racks as indicated in table 1. The fan equipment was that designed for 1941-1942 installation and consisted of seven centrifugal fans of $7\frac{1}{2}$ in. diameter, mounted on a transverse shaft, installed beneath the floor racks at each end of the car and belt driven by means of a car wheel power take-off device. The direction of the air flow was toward the ice bunkers. The combined output of the 14 fans in each dar in cubic feet per minute at different speeds of the car is given by the fan manufacturers as follows:

10 miles per hour ----- 1,424 c.f.m.

25 miles per hour ----- 3,560 c.f.m.

50 miles per hour ----- 7,120 c.f.m.

60 miles per hour ----- 8,504 c.f.m..

With a load of 1,576 packages of cherries the unoccupied space is approximately 1,216 cubic feet; with a load of 1,944 packages, it is 1,021 cubic feet. At normal running speed the fans in cars loaded with cherries should move the air several times per minute over the ice in the bunkers.

Location of electric resistance thermometers.

	Air temperatures	
Top air 1/	center line	bunker
Bottom air 2/	center line	bunker
	Fruit temperatures	
Top fruit 3/	center line	bunker
" "	south side	bunker
" "	center line	quarter length
" "	south side	quarter length
" "	center line	doorway
Middle fruit 4/	center line	quarter length
Bottom fruit	center line	bunker
" "	south side	bunker
" "	south side	quarter length
" "	center line	doorway

1/ 1 foot in front of bulkhead; 1 foot from ceiling.
2/ Level with floor rack at bottom opening of bulkhead.
3/ At center of package between fruits. Top fruit temperature positions varied with height of stacks indicated in table 2.
4/ Middle fruit position was in 4th or 5th layer depending on load height.

In this report "fruit temperatures" are only approximate since it was not possible to insert the thermometers used in cherry fruits; hence it was necessary to assume that air temperature in the center of a package represents the temperature of the surrounding fruit.

Loading data.

All cars excepting N.R.C. 147 were loaded through tunnels. In this exception the fruit was trucked into the car, and precooling was accomplished with portable bunker-bulkhead fans after the car had been loaded. The precooling fans operated in this car from 4:40 P.M. June 21 to 9:45 A.M. June 22, but the initial charge of salt, inadvertently, was not added by the shipper until 12:01 A.M. June 22. The amount of precooling accomplished is indicated in Table 6. The degree of precooling varied greatly in the different cars and in different lots of fruit in the same car as indicated in table 2.

Ice and salt record.

Ice and salt furnished in Table 3.

All cars were initially iced without salt on the afternoon of June 19. Before the cars were placed for loading the bunkers were replenished to capacity. In cars N.P. 92035 and N.P. 93154 which had to be transferred to tracks of the Union Pacific R.R., the replenishment was done at 8:40 P.M. June 20. With the remaining cars it was done at 9:30 A.M. June 21, the day of loading.

Icing instructions uniformly ordered 3 percent salt at the initial icing and at all reicings for all cars except N.P. 92069 in which salt at reicing stations was to be as ordered by officials of the Department of Agriculture accompanying the test.

To conform with the usual practice of the shippers the initial charge of salt was added to cars N.P. 92035, N.P. 92140, N.P. 93588 and N.P. 93154 twelve hours or longer before loading was started. The initial charge of salt furnished by the carrier to N.R.C. 147 was added after the fruit had been loaded and precooled for approximately 16 hours. It was added to N.R.C. 204 and N.P. 92069 immediately after loading. Cold air was blown through ducts into the two latter cars prior to and during loading.

There were marked variations in the salting practices used in the different cars as will be observed in Table 3. These variations were made because of differences in the amount of precooling of the different car lots and an endeavor to give shippers protection as nearly as possible in accordance with their desires as well as the exploratory nature of the tests.

Application of solid carbon dioxide and removal of air samples for gas analysis.

After bracing the loaded car, approximately 800 pounds of solid carbon dioxide, in 75 pound express cartons, were placed in a special crib on the bracing stringers at the doorway. In addition to this main source of carbon dioxide, one 70 pound naked cake of dry ice was added to each ice bunker at the completion of loading. This bunker charge sublimed rapidly so that there was an early accumulation of carbon dioxide gas inside the car. Applications of dry ice en route are shown in Table 13.

Samples of air for gas analyses were removed from the interior of the car at the doorway by means of one-quarter inch copper tubing which extended to the quarterlength floor rack position within the car. Samples were withdrawn from only one position per car since previous experience had shown no measurable stratification of carbon dioxide in fully iced refrigerator cars. The percentage of carbon dioxide in the sample was determined by means of a Hays gas analyzer.

Test fruit.

In order to have comparable fruit in each of the cars for examination at destination, special test boxes were placed on top of the load at the top quarterlength centerline position. Each car contained a box of non-inoculated cherries and a divided box of fruit inoculated with two important cherry-decay fungi.

The fruit was selected from that delivered at the warehouse by two growers the evening of June 19. The cherries used in the non-inoculated packages were medium bright to dark red, and had an average soluble solid content of 17.0 percent, as determined by a Zeiss refractometer. They were carefully composited, and stored overnight in the receiving room at about 50°F. The following morning the fruit was packed with the standard double-face pack in Campbell lugs by one packer. The packed boxes were held in cold storage until the following day when the cars were loaded.

The cherries selected for inoculation were likewise red to dark red but averaged 21.5 percent soluble solids. They were sorted and composited the evening of June 19, and were stored over-night at a temperature of 32-35° F. The following morning enough cherries to fill one-half of each 7 divided Campbell lugs were removed to the packing room. Each fruit was punctured once by means of a sterile dissecting needle, and the cherries then were dipped in a heavy suspension of Cladosporium (green mold) spores. The fruit was partially dried before being loose-packed into one end of each box. The species of Cladosporium used in this test had been isolated from a decaying cherry and was typical of that which causes one of the most serious decays of sweet cherries in transit from the Pacific Northwest.

When these inoculations were completed cherries from the same lot were removed from cold storage to the packing room for inoculation with the brown rot fungus. As soon as the surface of the cherries became wet with condensation moisture they were placed in an inoculation box and dusted with a mixture of kaolin and Sclerotinia (brown rot) spores. Sclerotinia fructicola (Wint.) Rehm, which causes a destructive decay of sweet cherries in California, was used in this test. Immediately following inoculation the cherries were loose-packed into the other half of the previously described test boxes and incubated in a large moist chamber at about 65°F. for 12 hours. The boxes were then stored at 32-35° until the following day when the cars were loaded.

In addition to the previously mentioned test fruit, 4 commercially packed boxes were included for use in determining consumer preference. The cherries were from the same lot as that used for the non-inoculated series, and all of the boxes were double-face packed by one packer. Two of these boxes were shipped at the top quarter-length position of a car containing dry ice (N.P. 93588), and the other two were placed at the same position in a car without dry ice (N.R.C. 147).

PRESENTATION OF RESULTS

Refrigeration in transit

Complete temperature records of the seven cars under observation are presented in tables 4 to 10 and a comparison of commodity temperatures at four positions in each car is given in table 11.

Fruit temperatures during the first 36 to 48 hours as recorded in these tables are consistent with the fruit temperatures recorded during loading and given in table 2. Two factors were responsible for this. First, thermometer leads were placed in packages of fruit at each shipper's cold storage plant the day before loading. When these packages were placed in a car the fruit temperatures at each location in that car were uniform and did not represent the range

of variable temperatures found in the fruit at large. After being placed in position in a car the temperature of the fruit in packages containing thermometer leads changed through the influence of surrounding packages. Second, the cars were loaded at various times during the day and evening of June 21. They did not move from Yakima until 3:15 P.M. June 22. During the interim fans were not in operation which accounts for the fact that in all fan cars fruit temperatures at the top of the loads increased and those at the bottom decreased. After departure from Yakima the mechanical circulation of air in the fan cars effected an equalization of temperatures, but it required several hours after the cars started to move for air circulation in the fan cars to compensate for the temperature changes which took place while they were standing at Yakima.

Maximum and minimum fruit temperatures and the temperature in packages placed at the quarter-length center line position midway between the top and bottom layers are shown in Figures 1 to 4.

Fruit temperatures in loads of different height.

In the comparison of maximum and minimum temperatures in loads of three heights illustrated in fig. 1, it was necessary to use the records of a 1944-box load (11 packages or 55 inches high) in freight car N.P. 93154 and those of a 1576-box load (9 packages or 45 inches high) in freight car N.P. 93588, both of which were supplied with dry ice, in comparison with those of a 1576-box load (7 packages or 35 inches high) in express car N.R.C. 147 that did not have dry ice. Temperature records of the express car having dry ice (N.R.C. 204) are complete only to Minneapolis where it was diverted.

The data show (see fig. 1) that between Yakima and New York City there was a mean spread of 7.7°F. between maximum and minimum temperatures in the express car loaded 7 high; 9.6° in a freight car loaded 9 high; and 11.6° in a freight car loaded 11 high. The express cars used in this test had higher minimum fruit temperatures than the freight cars. As shown in fig. 1 the spreads between maximum and minimum temperatures do not indicate corresponding differences in top layer fruit temperatures because of the differences in the degree of precooling of the different loads and because the freight car with the heavy load had heavier applications of salt in transit. A comparison of differences in the maximum temperatures early in the trip (which are critical in fresh fruit shipments) might be misleading. However, after 100 hours in transit which allowed adjustments in temperature to occur due to these factors, the following conditions prevailed at comparable location in the top layer:

Freight car, 11-high load	(precooled approximately to 45°)	39.8°.
Freight car, 9-high "	(" " " 38°)	38.1°.
Express car, 7-high "	(" " " 32°)	37.2°.
Express car, 7-high "	(" " " 38°)	40.9°.

(All cars had dry ice at the bracing except the last car.)

These temperatures indicate that with adequate precooling and transit refrigeration, as good or better top layer fruit temperatures were obtained in a freight car loaded 11-high as in an express car loaded 7-high even though the spread between the maximum and minimum temperatures was greater in the high load.

Effect of mechanical circulation of air.

In contrast to the above is the striking influence of mechanical circulation of air in securing uniformity of fruit temperatures throughout a car load, whether stacked 45 or 60 inches high, as illustrated in figs. 2, 3, and 4. In the three fan cars under test the average spread between maximum and minimum fruit temperatures from Yakima to New York City varied from 3.3 to 4.2° F.

These averages are probably greater and more variable than might have been obtained had all the fruit been precooled to a uniform temperature and had the cars not remained stationary in the yards at Yakima for 15 to 24 hours after loading, because after 30 hours of movement the spread in all cars was narrowed to approximately 2°F. This spread was generally maintained through the cool area of Montana, then became slightly greater as warmer weather (see fig. 5) was encountered farther east. East of Spokane the greatest temperature spread was in N.P. 92069. This car had dry ice in the bracing and in it the lowest fruit temperature prevailed at the bottom of the load at the doorway (see table 12). However, the influence of the dry ice on the temperature spread apparently averaged less than one degree. While the fruit temperatures were very good throughout the fan cars, the highest fruit temperatures in those cars were most frequently found in the top of the load at the south side adjacent to the ice bunkers. (Table 12.). In cars not having dry ice the coolest portion of the load was at the quarterlength. The graphs show that fruit at the middle quarterlength position (half the load height) had temperatures very near the minimum for the car, whereas in ordinary cars the fruit temperature at this point was approximately midway between the maximum and minimum temperatures.

In fig. 2 the effect of fans upon temperature conditions in a heavy load is illustrated. The satisfactory maximum temperatures in the car with fans suggest that even heavier loads than 34,000 lbs. might be carried.

That temperature conditions could be more satisfactorily maintained in a load of 1944 boxes in a freight refrigerator car with fans than in loads of 1576 boxes in either ordinary freight or express refrigerator cars without fans is illustrated in fig. 3.

Fig. 4 shows fruit temperatures in three fan cars with variations in height of load and in precooling and salting methods. The fruit in N.P. 92069 probably was precooled to a lower temperature than the data in table 2 indicate, because prior to and during loading a blast of cold air was blown into the car from an adjacent cold storage plant. The fruit temperatures recorded in table 2 were taken before the fruit was subjected to the cold air blast. The initial charge of 320 lbs. of salt was added to the ice after loading and at this time 900 pounds of dry ice was also placed in the car. The initial charge of salt was added to the two other fan cars several hours before loading was started. These conditions resulted in a more rapid fall of fruit temperatures in N.P. 92069. At Helena, Mont., 38 hours after departure, its maximum fruit temperature was 30.2°F. and its minimum fruit temperature was 27.3°. For this reason no additional salt was added to this car during a period of 83 hours between Spokane and Dilworth, Minn., after which 3 percent plus 50 pounds of salt were added at each icing station prior to reaching Hornell, N.Y. This icing practice held fruit temperatures quite uniform below 33.5° with comparatively high outside temperatures. (see fig. 5).

Comparable amounts of salt and ice were added to cars N.P. 92035 and N.P. 92140. The reason that fruit temperatures in N.P. 92140 were lowered more rapidly than in N.P. 92035 may be attributed to the additional heat that had to be removed from the 6,440 pounds heavier lading in the latter car.

Thus it may be seen that the degree of precooling of the fruit, the manner of cooling the car prior to and during loading, the weight of the load and the time of adding the initial charge of salt, all are important factors to be considered in the salting of ice during transit. It is apparent that when fruit is cooled to a point near 32°F. before loading, 320 pounds of salt (3%) may be an excessive amount to add to the ice immediately after loading.

The ice and salt record in table 3 shows that the fan cars used more ice than standard cars. When the addition of salt is ordered on a percentage basis, the faster melting of ice because of circulation of air by the fans results in a cumulative effect that is difficult to anticipate. The greater the ice meltage between icing stations the greater becomes the calculated weight of salt to be added and this in turn results in a still greater ice meltage between the next icing stations. For this reason it seems desirable to modify customary instructions for adding salt when fan cars are used. Ordering stated weights of salt at a given icing station would be a safer practice. This has already been recommended by the Department of Agriculture for the shipment of precooled pears in standard cars.

The desirable weights of salt to be added to ice in fan cars for a given temperature range is not known at present. This calls for additional study because icing stations are not spaced at equal distances. The transit time between icing stations on this test varied from 14 to 42 hours.

Period of fan operation.

A record was kept of the periods when the cars were standing between Yakima and Jersey City, and from the total time in transit the following data were secured: The fans were in operation 62 percent of the time in transit. Of the 38 percent representing time standing, 13.2 percent was made up of comparatively short stops between division points while 24.8 percent of the transit time was spent standing at division points.

After departure from Yakima the longest periods of delay were in the vicinity of Chicago. Between Clearing and Hammond the cars were standing still 5 hrs., 45 min., in a period of 7-1/2 hours. Data in table 11 show that during this period the fruit temperatures in the top layers of the fan cars increased 0.3° to 1.3°F. Comparable increases in top-layer temperatures in the standard cars did not take place during that period but became apparent after a lag of several hours at Marion, Ohio, by which time a drop in temperature had taken place in the fan cars. This difference in behavior is explained by the fact that almost immediately after the fans stopped there was a reversal in the direction of air movement in the fan cars which caused a quick increase in the difference between fruit and air temperatures at the top of the cars. However, as soon as the fans began to operate when the cars started to move, this difference largely disappeared in the fan cars but persisted in the standard cars. The data indicate that standing time totaling 8-1/4 hours in the Chicago area with an outside temperature as high as 97° did not seriously affect fruit temperatures in the fan cars.

Concentrations of carbon dioxide gas.

Standing test: CO_2 gas retention in cars.

Studies on the retention of carbon dioxide gas were made on 12 refrigerator cars in order to choose equipment suitable for the transportation test. Six standard reconditioned Northern Pacific freight refrigerator cars of the 93,000 series, three fan equipped freight refrigerator cars of the 92,000 series, and three standard N.R.C. 50-ft. express cars were used in this preliminary test.

All of the cars were warm, dry, and contained no water-ice in their bunkers. Copper tubing, extending from the quarterlength floor-rack level through the doorway to the outside of each car was used to remove samples of air for gas analysis. One-hundred and fifty-five pounds of unwrapped, unbroken cakes of solid carbon dioxide were placed on the floor racks of each car at the doorway. Samples of air were taken from within each car and analyzed at irregular intervals over a 25-hour period. The results of these analyses are shown in Fig. 6.

These 12 cars were chosen for their apparent gas tightness as judged by visible characteristics. Nevertheless as shown in Fig. 6, they varied greatly. Car No. 93154 proved to be exceptionally gas-tight. It maintained from 22 to 26 percent CO_2 for 24 hours, whereas No. 93725 in the same series retained less than 10 percent for the same period. The cars in the 92,000 series also showed a similar variation. Generally speaking, the express cars failed to hold carbon dioxide as well as the freight cars.

As was anticipated, with no ice in the bunkers, air movement within the cars was restricted. This fact, together with the difference in specific gravity of carbon dioxide and normal air resulted in atmospheric stratification during sublimation of the dry ice. Air in the lower half of the car had CO_2 gas concentrations as shown in Fig. 6. Air at the ceiling level had only approximately one-half as much. The dry ice remaining at the termination of the test averaged 45 pounds per car. The cars for the transportation test with sweet cherries were selected from these 12 and were as follows: N.P. 93154, N.P. 93588, N.P. 92069, N.P. 92035, N.P. 92140, N.R.C. 147 and N.R.C. 204.

Gas concentration in transit.

Standard refrigeration in 4 of the 7 cars in the test was supplemented with solid carbon dioxide. These 4 cars were as follows: 2 standard freight cars, (N.P. 93154 and N.P. 93588), 1 fan car (N.P. 92069), and 1 standard express car (N.R.C. 204). Concentrations of carbon dioxide in the air in the different cars were determined at irregular intervals during transit to destination and are shown in Table 13 and Fig. 7.

All four of these cars received approximately the same initial amount of solid carbon dioxide (940 lbs.), and replenishments enroute were also similar (Table 13.). As in the standing test (Fig. 6) car N. P. 93154 proved to be exceptionally gastight. With one replenishment at Laurel, all cars except the fan car (N.P. 92069) maintained concentrations of 13 percent carbon dioxide or more for the first 4 days enroute. With the dissipation of the charge at the bracing in transit and resultant low gas concentration at Chicago replenishment at Chicago produced more striking results in increasing the gas concentration than did the replenishment at Laurel. From the data in Fig. 7 it must be concluded that

the dry ice probably should have been replenished at Minneapolis as well as at Laurel and Chicago in order to maintain desired gas concentrations throughout the trip.

All of the gas cars were loaded from 14 to 18 hours prior to departure. During this time, analyses were made at irregular intervals in an attempt to record maximum gas concentrations in each car. While all of these data are not shown in Table 13, the maximum gas concentrations found in 4 cars were recorded at the time of departure.

Satisfactory gas concentrations were not maintained in the fan car. During the standing test (Fig. 6) with the fans not running, this car (N.P. 92069) compared favorably in gas retention with car N.P. 93588. In transit, however, the latter retained approximately twice as much gas as the fan car. With the fans in operation, air movement within the car is greatly increased. Direction of flow is reversed with air in great volume being directed toward the top of the ice bunker and against the hatch plugs. The hatch plugs in these cars were of the convential wood type with canvas edging and were not well adapted to holding a large volume of air under rapid movement, without considerable leakage. Judging from the results of this test there is some question as to the desirability of attempting to use dry ice in fan cars. Certainly the final answer awaits comparison of the performance of a larger number of fan cars during standing tests and operating tests as well.

Recharging with dry ice at Laurel and Chicago can be strongly recommended. The addition of 100 pounds to each bunker resulted in a rapid accumulation of carbon dioxide gas within the car and the effects of this practice persisted for 24 to 30 hours. A reduction in the initial charge and the addition of dry ice at every icing station would result in a more efficient use of solid carbon dioxide with present refrigerator cars.

Effect of transit conditions on fruit at destination.

Condition and appearance of test fruit at destination.

Car N.R.C. 204 was diverted at Minneapolis The test boxes in it were transferred to N.P. 93588 and carried through to New York. Similarly at Croxton yards the test lots in N.P. 92069 were removed at 4:00 P.M. July 30 and held in cold storage until the time of unloading the remaining cars (between 1:00 and 5:00 A.M. July 1st). All of the test boxes were then taken to the laboratory of the U. S. Dept. of Agriculture and held at room temperatures of 75° to 85°F. until examinations were completed.

All of the non-inoculated test boxes were opened on the face side in the afternoon of July 1, the day of unloading, and examined for color and appearance. The boxes were then relidded and left in the laboratory until the afternoon of July 3rd when final notes were taken on color, condition, loss in weight and decay. These data are assembled in Table 14.

In evaluating these results it should be kept in mind that while all test boxes were in the same relative position in each car (top of the load, quarter-length), their actual height in the load and consequently the refrigeration that they received, varied greatly. The test fruit in the express cars was approxi-

mately 44 inches from the floor racks; in the 27,500 lb. loads in 40 ft. freight cars (N.P. 92140, N.P. 93588, N.P. 92069) 51 inches, and in the heavy loads of 34,000 lbs. (N.P. 92035, N.P. 93154) 65 inches, or one layer higher than the regular loads. In the fan cars this position was one of the coldest parts of the load, whereas in the standard load in freight and express refrigerators the top quarter-length position was generally the warmest.

The test fruit from the non-gasses express car N.R.C. 147 on the day of unloading was markedly darker in color than any of the other test lots. The fruit appeared softer and the stems were mostly dry and brown. The fruit carried in fan car N.P. 92069 at low temperatures of about 29°-32°F. plus CO_2 gas was the brightest in color. The stems in this and the other gassed cars were mostly green but rather dry. The test lots from the other gassed cars were all quite similar in appearance, the fruit color being slightly darker than that in N.P. 92069. The test fruit in the heavily loaded 40 ft. freight car at temperatures of 40° to 42° in gas (N.P. 93154) carried as well as the 27,500 lb. load in the fan car without gas and much better than a similar load in the express car (N.R.C. 147) without gas. This car (N.P. 93154), and another car not in the test but shipped under express service and carrying 475 boxes of 8 1/2 row cherries, "topped" the market of 12 cars for the day.

In an examination of the fruit 2 days after unloading no change was noted in the relative differences in color and appearance found at the first inspection. All lots were darker in color, the stems had lost much of their freshness, and were considerably browned. With the exception of the test fruit from N.R.C. 147, none of the lots showed any visual or physical differences that could be correlated with transit temperatures, which ranged from slightly under 30° to 42°F. in the various test cars. In other words, none of the observers could detect any "chilling effect" or low temperature injury as often reported by various shippers and receivers when sweet cherries are transported below 40°.

Moisture losses in fruit carried in fan cars with and without gas were compared with those in standard freight and express cars. These data in Table 14 show no significant differences due to increased air movement in fan cars.

Studies on decay in packed boxes.

The results on decay in the non-inoculated lots (Table 14) show that the use of dry ice caused a marked reduction in the percentage of decayed fruit. The three cars in which dry ice was not used averaged 14.1 percent decay, whereas the cars with dry ice averaged only 6.2 percent. The greatest amount of decay was found in N.R.C. 147. This car was loaded with warm fruit (45°-65°F.) that was precooled in the car after loading. A delay of 7 hours in salting resulted in much slower cooling than would have occurred if the salt had been added at the completion of loading when the precooling fans were started. The test fruit for this car was held with the commercial fruit at about 45° for several hours prior to loading. These factors undoubtedly contributed to the high percentage of decay encountered. The test box showing the least decay was shipped in a standard express car with dry ice (N.R.C. 204). In addition to having the protective effect of CO_2, the fruit in this car was exceptionally well precooled (29°-33°F.) and, due to the low load, the temperature of the fruit in the top layer remained fairly low all during the transit period.

The decay lesions on the test fruit shipped in N.R.C. 147 were considerably larger than those on the fruit in the other cars; they showed an extensive development of surface mold, and in handling on the second day after arrival they had a tendency to "leak" badly. The test fruit from N.R.C. 204 and N.P. 93588 had comparatively small decay lesions, very little surface mold, and showed no tendency to "leak." When the "fill" of the test packages was examined two days after unloading, the control of mold growth resulting from the use of solid carbon dioxide was easily discernible even at some distance.

It is interesting to note that the test fruit in the heavy load with CO_2 (N.P. 93154) developed less decay than that in either of the fan cars without dry ice (N.P. 92035 and N.P. 92140), despite the fact that the temperatures in the latter cars were at least 8° lower than in the non-fan car. There was more than twice as much decay in the light-load express car (N.R.C. 147) without CO_2 as in the heavy-load freight car (N.P. 93154) with CO_2, even though the fruit was 20 inches higher in the latter car.

Although both low temperature and CO_2 retard the development of mold, in the present test gas was the more effective agent. It would seem that maximum protection of the fruit could be obtained by employing a fan-car with CO_2; however, when this combination was used (N.P. 92069) mold control was not improved. This may be accounted for by the fact that the concentration of CO_2 was considerably lower in the fan-car than in the standard car (Fig. 7).

<u>Studies on decay in inoculated cherries.</u>

When the cherries inoculated with the green mold fungus were examined on the day of unloading very striking results were obtained (Table 14). The decay in the lots shipped in cars containing CO_2 averaged only 7.5 percent, whereas in those shipped without this gas it averaged 81.9 percent. One day later the differences in decay between the lots shipped with and without dry ice were greatly reduced. This is to be expected since CO_2 does not kill molds but merely retards or prevents their development while the gas is present. The lesions on the fruit shipped with CO_2 were small and showed little surface mold, whereas those on cherries carried without this gas were decidedly larger and had more external mold.

The cherries inoculated with the brown rot fungus showed no decay on the day of unloading, but on the following day all lots had high percentages. (Table 14). The fact that the test fruit in N.R.C. 147 showed no decay on the first day indicated that low temperature alone (about 40°F.) was effective in retarding the development of brown rot. Although decay lesions were not visible to the naked eye the day the fruit was unloaded, the rapid development of the rot during the ensuing 24 hours indicates that infection had occurred. The fruit from the cars containing CO_2 averaged 70.9 percent decay, while that in the cars without gas averaged 83.4 percent. The differences in appearance between the lots shipped with and without CO_2 were more marked than the percentages of decay would suggest. Actually the fruit from the gas cars showed small decay lesions, with little surface mold and no sporulation, whereas the fruit from the cars without gas had comparatively large lesions, with abundant surface mold and some sporulation.

Consumer preference trial.

A consumer preference trial with gassed and un-gassed fruit was made in a preliminary way with the cooperation of the Great Atlantic and Pacific Tea Co. Four commercially packed boxes of sweet cherries comparable to the regular test lots were used. Two of the boxes were transported in a car with CO_2 and two in a car without gas. After holding at room temperatures for approximately 24 hours, both lots were removed to one of the company's retail stores. The boxes were placed side by side, face open, about 8 feet away from the prospective customers. Customers were free to choose fruit from whatever box they desired. The results of this trial were not as could be expected on the basis of "trade" or wholesale's preference. The customer was forced to choose largely on the basis of color, and was not permitted to examine the fruit for condition. Both boxes of the ungassed fruit were disposed of before any appreciable amount of the gassed fruit was sold. Neither the retailer nor the customer was acquainted with the history of these trial boxes. The un-gassed fruit, however, was visibly darker. This test in reality confirmed the often expressed opinion of many, that consumers prefer well matured, dark colored cherries to the bright red colored fruit preferred by the "trade". There was a great difference in the amount of decay in these two lots of fruit (approximately 19 percent in the un-gassed and 6 percent in the gassed lot), the darker lot sold sooner than the gassed fruit despite the greater amount of decay.

DISCUSSION AND SUMMARY

The temperature records show that in refrigerator cars not having mechanical circulation of air the spread between maximum and minimum fruit temperatures increased with the height of the load, and that under comparable conditions this difference increased approximately at the rate of 1° for each 5-inch cherry box increase in height. The precooling of the fruit and the amount of salt used with the ice markedly affected the temperatures in the top layers. In this test the top-layer fruit temperatures in a freight refrigerator car carrying 1944 boxes of cherries, stacked 11 and 12 high, were fully as satisfactory as in an express car carrying 1576 boxes of cherries stacked 7 and 8 high, notwithstanding the fact that the spread between maximum and minimum temperatures averaged approximately 4° greater in the high load.

The most satisfactory temperature conditions were maintained in the fan cars. In contrast to an average temperature spread of 11.6°F. between the maximum and minimum fruit temperatures in a standard car, the average temperature spread in a fan car having an equivalent load of 1944 boxes was 3.3°. After temperature adjustments during the initial part of the transit period, the spread in this type of car was approximately 2° while passing through moderate temperatures and approximately 3° when passing through warm weather.

The fruit temperatures at the top of a heavy load in a fan car were reduced during transit from approximately 35° to 32° F. The temperature reduction in the bottom layer of the same load was about the same. This suggests that loads even heavier than 34,000 lbs. might be adequately refrigerated in a fan car.

In a fan car loaded with fruit having a temperature of approximately 37° F. and supplied with 3 percent salt immediately after loading, the effect of the fans was to reduce the temperature of the entire load to a range of 27.3° to

30.2° after 45 hours in transit. This showed that the use of salt in fan cars should be goverened in part by the temperature of the fruit at the time of loading.

The record of ice meltage in the various cars under test shows that greater weights of ice were melted in the fan cars than in standard cars and that when the addition of salt in transit was based on a percentage of the ice furnished at each reicing station, the amounts of salt added to a fan car were greater than those added to a standard car. This also suggests the desirability of making studies to determine the most satisfactory salting practices to be used with fan cars.

The records show that the fans were in operation 62 percent of the transit time. A total standing time of 8-1/4 hours in the Chicago area did not seriously affect the fruit temperatures in the fan cars.

The use of 940 lbs. of solid carbon dioxide at Yakima, and a replenishment with 200 lbs. at Laurel, Mont., maintained carbon dioxide concentrations above 13 percent for four days in all cars so supplied excepting the fan car in which satisfactory gas concentrations were not maintained. Records of gas retentiveness made in empty cars in a standing test before the cars were loaded indicated that the mechanical circulation of air in the fan car increased the rate of loss of carbon dioxide and this doubtless explains why it was impossible to keep up the concentration of carbon dioxide in this car during transit.

Recharging standard cars with 200 pounds of dry ice at Laurel and Chicago resulted in a rapid accumulation of carbon dioxide gas within the cars, the effects of which lasted for from 24 to 30 hours. The records on gas concentrations during transit indicate that replenishment should have been made at Minneapolis also and suggest that the solid carbon dioxide could be used more efficiently by having a smaller initial charge, and adding dry ice at every icing station.

Test boxes of cherries were carried on the top of each load. This fruit was all of the same maturity and was subjected to identical conditions until after packing. Of these lots, the fruit in the express car that was precooled in the car after loading and shipped without gas was the darkest in color and looked the ripest on arrival at destination. The fruit was softer and the stems were the most dry and brown of any of the lots. After two days at destination this fruit had 19 percent decay and was wet and sticky from the decay.

The test fruit carried in a fan car with temperatures mostly from 29° to 32°F., and having carbon dioxide in transit, was the brightest in color with no apparent injury from low temperatures. The appearance of the test fruit in the other cars having carbon dioxide was similar, being slightly darker than in the car with low temperatures but brighter than in the non-gassed cars. After two days at destination the decay in test fruit from cars having carbon dioxide gas averaged 6.2 percent in contrast to 14.1 percent in fruit from non-gassed cars.

From the standpoint of decay development at the top of 34,000 lb. loads, the effect of carbon dioxide gas in a standard 40 ft. freight refrigerator car more than offset the benefit of approximately 7°F. lower temperature obtained in a fan car.

A retailer-consumer test showed that, in contrast to receiver preference for bright red cherries from cars shipped with carbon dioxide, consumer preference was for dark colored and riper looking cherries from a non-gassed car.

Upon arrival in New York cherries inoculated with the green mold fungus (Cladosporium sp.) at Yakima and carried on top of the regular loads showed an average of 7.5 percent decay when carbon dioxide was used and an average of 81.9 percent decay in cars without gas. After one day at destination these differences were greatly reduced. Cherries inoculated with the brown rot fungus (Sclerotinia fructincola) did not show such a marked effect of the gas upon the percentage of fruits decayed. However, its retarding effect upon brown rot decay development was very apparent. Low temperatures appeared to retard this type of decay more than it did green mold rot.

Table 1. Characteristics of cars under test.

Specifications	Car number: N.P. 92035	N.P. 92140	N.R.C. 147	N.P. 93588	N.P. 93154	N.R.C. 204	N.P. 92069
Length between bulkheads	34' 6"	34'6"	41' 6"	34' 6"	34' 6"	41' 6"	34' 6"
Width inside	8' 10"	8' 10"	8' 8½"	8' 10"	8' 10"	8' 8½"	8' 10"
Height - Floor racks to ceiling	6' 8½"	6' 8½"	6' 4"	6' 10"	6' 10"	6' 4"	6' 8½"
Height - Floor to ceiling	7' 4"	7' 4"	7' 2"	7' 4"	7' 4"	7' 2"	7' 4"
Cubic feet loading space	2044	2044	2289	2082	2082	2289	2044
Ice bunkers (Depth	6' 2	6' 2"	5' 8"	6' 2"	6' 2"	5' 8"	6' 2"
(Length	8' 10"	8' 10"	8' 4"	8' 10"	8' 10"	8' 4"	8' 10"
(Width	31½"	31½"	42"	31½"	31½"	42"	31½"
(Capacity - Chunk ice	10,700 lbs.	10,700	12,000	10,700	10,700	12,000	10,700
Air circulating fans	"Preco"	"Preco"	None	None	None	None	"Preco"
Date built	Nov. 1922	Jan. 1923	Feb. 1929	Nov. 1922	Oct. 1922	Feb. 1929	Dec. 1922
Date rebuilt	Mar. 1942	Mar. 1942	Mar. 1939	Sept. 1941	Mar. 1942	Jan. 1939	Feb. 1942
Siding	Wood	Wood	Wood	Wood	Wood	Wood	Wood
Roof	Metal	Metal	Comp.	Metal	Metal	Comp.	Metal
Insulation[1] Floor	2½"	2½"	2½"	2½"	2½"	2½"	2½"
Side & end wall	2"	2"	3½"	2"	2"	3½"	2"
Roof	2½"	2½"	3"	2½"	2½"	3"	2½"
Bulkhead front	1"	1"		1"	1"		1"
Ice bunkers	Basket[2]	Basket[2]	Full basket	Basket[2]	Basket[2]	Full basket	Basket[2]
Top bulkhead opening	12"	12"	15"[3]	12"	12"	15"	12"[3]
Bottom " "	4½"	4½"	12"	12"	12"	12"	4½"
Fan to bunker Floor rack	26" solid wood	26" solid wood					26" solid wood
Height of floor racks	7½"	7½"	10"	6"	6"	10"	7½"
Outside stringers	1½" holes[4]	1½" holes[4]	Rabbitted	Rabbitted	Rabbitted	Rabbitted	1½" holes[4]
Doorway stringers	1½" holes	1½" holes	Rabbitted	Rabbitted	Rabbitted	Rabbitted	1½" holes

(1) Exclusive of building paper, air spaces and wood.
(2) Baskets front and back.
(3) Top openings louvered with sheet metal.
(4) Cross ventilation at doorway section.

Table 2. Car loading data.

Item	Car number						
	N.P. 92035	N.P. 92140	N.R.C. 147	N.P. 93588	N.P. 93154	N.R.C. 204	N.P. 92069
Loading point	Yakima	Yakima	Yakima	Yakima	Yakima	Gleed	Yakima
Final destination	New York	Waverley, N.J.	New York	New York	New York	Minneapolis	Bridgeport, Conn
Routing	N.P.-CB&Q-Erie	Same	Same	Same	Same	N.P.	Same + N.Y.N.H.&H.
Date loaded	June 21	June 21	June 21	June 21	June 21	June 21	June 21
Time started	10:00 A	7:15 P	10:00 A	7:30 P	3:00 P	7:00 P	7:00 P
Time finished	12:00 N	8:55 P	3:30 P	10:30 P	6:00 P	8:30 P	10:30 P
Billed weight (lbs.)	34,020	27,580	27,580	27,580	34,020	27,720	27,580
No. lugs at 17½ lbs.	1944	1576	1576	1576	1944	1584	1576
Fruit temperatures	36° - 38°	36° - 54°	46° - 65°	36° - 38°	48° - 52°	29° - 33°	37° - 43°
Fruit variety	Bing	Bing	Bing	Bing	Bing	Bing	Bing
Weight of "Campbell" lugs (lbs.)	17½	17½	17½	17½	17½	17½	17½
Size of lugs (inches)	5x11x16½	5x11x15½	5x11x16½	5x11x15½	5x11x15½	5x11x16½	5x11x16½
Lugs - Long (number)	23	23	28	23	23	28	23
Wide	8	8	8	8	8	8	8
High (stacks)	13-11 high	10-8 high	27-7 high	11-8 high	13-11 high	26-7 high	10-8 high
	10-10 "	13-9 "	1-8 "	11-9 "	10-10 "	2-8 "	13-9 "
				1-10 "			
Doorway bulkhead	31"	55"	31"	51½"	54"	29"	31½"
Height of load	60" - 55"	46" - 41"	39" - 34"	35" - 40" - 45"	58" - 63"	34" - 39"	40" - 45"
Height top of load to ceiling	20" - 25"	34" - 39"	37" - 42"	47" - 42" - 37"	24" - 19"	42" - 37"	40" - 35"
Solid CO_2 Doorway (lbs.)	0	0	0	810	780	840	760
Bunkers	0	0	0	140	130	140	140
Total	0	0	0	950	910	980	900
Stripping (stacks)	3-6-9-top	3-6-top	2-4-6-top	3-6-8-top	2-4-6-8-top	2-4-6-top	1-3-5-7-top
Vertical bulkhead stripping	Yes	No	Yes	Yes	No	Yes	No
Floor rack & bottom bulkhead papered	54" up 80" out	No	6" up 54" out	48" up 36" out	17" up 43" out	38" up 36" out	54" up 40" out
Car temperature when opened	37°	54°	52°	42°	34°	36°	34°
Car temperature when loaded	45°	54°	56°	49°	47°	32°	45°
Side Wall air space	3"	3"	2"	3"	3"	2"	3"

Table 3. Ice and salt added in transit.

Station	Date	Time	N.P. 92035 Lbs. Ice	N.P. 92035 Lbs. Salt	N.P. 92035 % Salt	N.P. 92140 Lbs. Ice	N.P. 92140 Lbs. Salt	N.P. 92140 % Salt	N.R.C. 147 Lbs. Ice	N.R.C. 147 Lbs. Salt	N.R.C. 147 % Salt	N.P. 93588 Lbs. Ice	N.P. 93588 Lbs. Salt	N.P. 93588 % Salt	N.P. 93154 Lbs. Ice	N.P. 93154 Lbs. Salt	N.P. 93154 % Salt	N.R.C. 204 Lbs. Ice	N.R.C. 204 Lbs. Salt	N.R.C. 204 % Salt	N.P. 92069 Lbs. Ice	N.P. 92069 Lbs. Salt	N.P. 92069 % Salt
Yakima	6/19/42	4:15P	10,700			10,700			12,000			10,700			10,700			12,000			10,700		
"	6/20/42	8:40P	870	321	3.0(1)										870	321	3.0(1)						
"	6/21/42	9:30A				2,175	321	3.0(1)	2,464			3,480	321	3.0(1)				4,224	360(2)	3.0(1)	2,030	321(2)	3.0(1)
"	6/22/42	9:30A	870	24	3.0	1,160	35	3.0				1,450	44	3.0	1,160	35	3.0	1,056	32	3.0	870	24	2.8
"	6/22/42	10:20A							5,642	360(3)	3.0(1)												
Yardley	6/23/42	7:30A	1,450	44	3.0	2,030	61	3.0	2,640	79	3.0	2,175	65	3.0	2,175	100	4.6	1,936	58	3.0	2,592	77	3.0
Laurel	6/25/42	6:00A	2,320	120	4.8	2,900	137	4.7	1,408	42	3.0	2,320	70	3.0	2,175	115)		1,760	53	3.0	2,465	0	0
Glendive	6/25/42	8:00P														50)	7.6						
Dilworth	6/26/42	10:00P	3,335	150	4.5	3,480	154	4.4	1,936	107	5.5	2,030	111	5.5	2,610	128	4.9	1,760	103	5.9	2,320	120	5.2
N. La Crosse	6/27/42	4:00P	2,300	69	3.0	2,400	72	3.0	600	68	11.3	600	68	11.3	600	68	11.3				2,300	119	5.2
Clearing	6/28/42	7:40A	1,050	81	7.7	1,050	81	7.7	750	72	9.6	800	74	9.3	650	69	10.6				1,300	89	6.9
Marion	6/29/42	2:00A	1,500	95	6.3	1,500	95	6.3	1,300	89	6.8	1,000	86	8.6	700	71	10.1				800	74	9.3
Hornell	6/29/42	9:45P	1,500	45	3.0	1,500	45	3.0	1,100	33	3.0	800	24	3.0	800	24	3.0				1,200	36	3.0
Total furnished			25,895	949		28,895	1,001		29,840	850		25,355	863		22,440	981		22,736	606		26,577	860	
Used for car cooling and fruit precooling			870			2,175			7,106(4)			3,480			870			4,224			2,030		
Total net			25,025	949	3.8	26,720	1,001	3.7	22,734	850	3.7	21,875	863	3.9	21,570	981	4.6	18,512	606	3.3	24,547	860	3.5

(1) Percentage of initial icing.
(2) Salt was added after loading, N.R.C. 204 at 8:30P, N.P. 92069 at 10:30 P.
(3) Additional salt was used during precooling period: 200 lbs. at 12:01 A - 6/22/42.
200 lbs. " 7:00 A - "
(4) 2,464 lbs. ice used for car cooling; estimated 5,642 lbs. ice used for fruit precooling.

N.P.
Car. 92035

Table 4. Temperatures in transit.

Load: Cherries - 1944 lugs - 34,020 lbs.

				Air Temp.		Commodity Temperatures												
						Top					Mid.	Bottom						
Station	Date 1942	Time	Out-side Temp.	Top Bunk C.L.	Bot. Bunk C.L.	Bunk C.L.	Bunk Side	Quart. C.L.	Quart. Side	Door C.L.	Quart. C.L.	Bunk C.L.	Bunk Side	Quart. Side	Door C.L.	Max-imum	Min-imum	Spread
Yakima	6/21	1:10P	70	41.6	22.3	35.2	34.1	34.7	34.8	35.3	32.9	33.0	31.6	32.9	34.4	35.3	31.6	3.7
"	6/22	12:45A	58	42.2	22.4	37.8	37.2	36.4	37.9	37.9	35.9	30.9	29.5	31.8	32.4	37.9	29.5	8.4
"	6/22	5:20A	57	41.5	24.4	38.2	37.9	37.3	38.7	38.6	36.0	30.0	28.9	31.1	31.6	38.7	30.0	8.7
"	6/22	12:30P	80	40.6	26.4	38.7	38.6	38.4	39.3	39.1	36.3	29.7	28.9	31.3	31.6	39.3	28.9	9.4
Pasco	6/22	7:30P	83	37.4	31.4	36.6	37.5	37.1	38.7	38.0	-	30.4	30.1	31.6	32.0	38.7	30.1	8.6
Washtucna	6/23	2:00A	67	34.1	33.6	35.8	37.1	36.2	37.2	37.7	36.5	30.9	31.3	32.3	32.7	37.7	30.9	6.8
Yardley	6/23	7:00A	57	36.2	33.1	35.0	36.3	35.2	35.9	37.2	-	32.0	32.7	32.8	33.4	37.2	32.0	5.2
Kootenai	6/23	12:45P	66	36.0	32.1	35.0	36.6	35.1	35.8	37.0	34.8	33.0	33.6	33.3	34.0	37.0	33.0	4.0
Paradise	6/23	8:00P P.T.	65	34.1	33.7	34.4	35.7	-	35.2	36.4	35.0	33.6	34.0	33.5	33.9	36.4	33.5	2.9
Missoula	6/24	2:20A	47	35.2	33.1	34.0	35.1	-	34.5	35.5	34.6	33.6	33.9	33.4	33.7	35.5	33.4	2.1
Garrison	6/24	7:30A	43	36.3	32.6	33.7	35.1	-	34.8	35.4	34.6	34.0	34.7	33.6	34.4	35.4	33.6	1.8
Helena	6/24	1:15P	73	34.3	33.6	34.0	35.1	-	34.5	35.5	34.7	34.1	34.8	33.5	34.0	35.5	33.5	2.0
Livingston	6/24	10:30P	60	36.7	34.5	34.6	35.9	-	35.3	35.7	34.7	34.7	35.1	34.0	34.5	35.9	34.0	1.9
Laurel	6/25	5:25A	49	35.4	35.5	35.4	36.8	-	36.1	36.6	35.2	35.5	35.9	34.5	35.6	36.8	34.5	2.3
Forsyth	6/25	12:45P	77	33.2	32.0	34.4	35.6	-	35.1	35.5	34.2	35.0	35.7	33.8	34.5	35.7	33.8	1.9
Marsh	6/25	6:30P	74	34.7	33.8	34.4	35.2	-	34.9	35.4	34.4	35.1	35.4	34.2	34.0	35.4	34.0	1.4
Dickinson	6/26	2:30A	59	35.0	32.6	34.1	35.6	-	34.9	35.3	34.0	34.7	35.5	33.9	34.0	35.6	33.9	1.7
Mandan	6/26	8:10A C.T.	68	36.2	32.4	34.2	35.7	-	34.8	35.3	33.5	34.9	35.7	34.7	34.1	35.7	33.5	2.2
Jamestown	6/26	2:45P	72	36.1	33.5	34.1	35.8	-	34.9	35.2	35.1	34.8	35.7	34.6	34.2	35.8	34.1	1.7
Dilworth	6/26	9:40P	65	35.2	34.3	34.6	36.3	-	35.7	35.5	34.5	35.3	36.1	34.4	34.4	36.3	34.4	1.9
Northtown	6/27	8:30A	70	32.2	30.9	32.9	34.8	-	33.7	34.3	33.2	34.6	35.5	33.2	33.0	35.5	32.9	2.6
No. LaCrosse	6/27	3:45P	82	35.4	31.5	33.1	35.0	-	33.6	34.0	33.2	34.6	35.1	33.3	32.6	35.1	32.6	2.5
Savanna	6/27	9:30P	81	34.3	29.4	31.6	33.3	-	32.4	32.5	32.2	32.5	33.4	31.6	31.1	33.4	31.1	2.3
Clearing	6/28	6:00A	71	34.2	31.6	32.4	34.4	-	33.3	33.3	32.2	32.9	34.1	32.3	31.9	34.4	31.9	2.5
Hammond	6/28	1:30P	97	35.6	31.2	32.7	34.9	-	34.3	34.0	32.2	33.4	33.4	31.7	31.9	34.9	31.7	3.2
Marion	6/29	2:00A E.T.	68	32.9	31.6	32.1	34.9	-	33.7	34.1	31.7	32.1	33.7	32.0	32.1	34.9	31.7	3.2
Kent	6/29	8:40A	69	30.4	30.6	31.9	34.4	-	33.6	32.9	31.7	32.0	33.6	32.0	32.1	34.4	31.7	2.7
Jamestown	6/29	4:00P	93	33.1	30.6	31.4	33.9	-	32.6	32.7	31.0	31.4	32.9	31.7	31.2	33.9	31.0	2.9
Hornell	6/29	9:00P	76	33.0	32.0	31.6	34.1	-	32.8	32.7	31.2	31.8	32.9	31.6	31.4	34.1	31.2	2.9
Pt. Jervis	6/30	8:30A	70	35.7	31.7	32.3	34.7	-	34.0	34.0	32.0	31.9	33.9	32.5	32.1	34.7	31.9	2.8
Croxton	6/30	1:30P	86	36.2	32.7	32.5	35.1	-	34.4	34.2	32.2	31.8	34.4	33.0	32.8	35.1	31.8	3.3
Erie Pier	7/1	3:00A	-	41.4	31.2	35.8	38.1	-	38.3	36.0	33.0	32.0	33.9	33.1	33.8	38.3	32.0	6.3

Table 5. Temperatures in transit.

Car N.P. 92140

Load: Cherries - 1576 lugs - 27,580 lbs.

Station	Date 1942	Time	Out-side Temp.	Air Temp. Top Bunk C.L.	Air Temp. Bot. Bunk C.L.	Commodity Temperatures: Top Bunk C.L.	Top Bunk Side	Top Quart. C.L.	Top Quart. Side	Top Door C.L.	Mid. Quart C.L.	Bottom Bunk C.L.	Bottom Bunk Side	Bottom Quart. Side	Bottom Door C.L.	Max-imum	Min-imum	Spread
Yakima	6/21	9:25P	66	50.0	28.1	39.7	39.5	38.8	39.0	37.7	38.2	37.5	38.7	37.5	38.4	39.7	37.5	2.2
"	6/22	2:00A	57	46.5	27.2	42.3	41.7	40.7	40.7	40.5	38.5	37.2	35.8	38.0	38.7	42.3	35.8	6.5
"	6/22	5:20A	57	45.3	25.3	42.9	43.1	41.5	41.2	41.8	37.7	35.8	33.0	37.3	38.1	43.1	33.0	10.1
"	6/22	12:30P	80	44.1	26.7	44.1	44.7	42.4	42.3	43.2	38.2	33.8	29.2	36.7	37.0	44.7	29.2	15.5
Pasco	6/22	7:30P	83	40.6	31.2	42.7	43.1	41.3	40.7	42.2	38.4	34.2	30.2	31.2	36.0	43.1	30.2	12.9
Washtucna	6/23	2:00A	67	36.5	33.7	41.7	42.7	40.7	40.5	42.2	38.2	35.0	31.9	37.2	36.2	42.7	31.9	10.8
Yardley	6/23	7:00A	57	39.0	32.1	40.2	41.5	39.0	39.4	41.2	38.0	35.7	34.0	37.8	36.4	41.5	34.0	7.5
Kootenai	6/23	12:45P	66	38.3	31.5	39.5	40.7	38.8	39.2	41.0	38.3	36.8	35.4	38.3	37.2	41.0	35.4	5.6
Paradise	6/23	8:00P	65	35.5	34.0	38.2	39.6	37.7	38.3	39.9	37.8	37.0	36.2	38.2	37.0	39.9	36.2	3.7
Missoula	6/24	2:20A M.T.	47	36.3	33.6	37.0	38.7	36.5	37.5	39.1	37.2	36.6	36.3	38.0	36.5	39.1	36.3	2.8
Garrison	6/24	7:30A	43	37.3	32.9	37.0	38.5	36.5	37.4	38.9	37.2	37.0	37.0	38.5	36.6	38.9	36.5	2.4
Helena	6/24	1:15P	73	35.5	33.6	36.7	38.0	36.3	37.3	38.3	37.1	36.9	36.9	38.0	36.5	38.3	36.3	2.0
Livingston	6/24	10:30P	60	38.5	34.6	37.1	38.6	37.0	38.1	39.0	37.2	37.3	37.6	38.8	37.1	39.0	37.0	2.0
Laurel	6/25	5:25A	49	35.8	35.0	37.3	38.7	37.3	38.4	39.2	37.2	37.4	37.8	39.0	37.4	39.2	37.2	2.0
Forsyth	6/25	12:45P	77	33.0	32.1	35.8	37.4	36.4	37.1	38.2	37.0	37.0	37.2	38.0	37.1	38.2	35.8	2.4
Marsh	6/25	6:30P	74	35.0	32.2	35.4	37.3	35.6	36.6	37.3	36.8	36.7	37.1	38.0	36.4	38.0	35.4	2.6
Dickinson	6/26	2:30A	59	35.3	31.6	34.8	37.1	35.0	36.3	37.2	36.0	36.0	36.9	37.7	35.4	37.7	34.8	2.9
Mandan	6/26	8:10A	68	35.7	29.9	34.3	36.5	34.1	35.5	36.5	35.2	35.7	36.2	37.0	35.1	37.0	34.1	2.9
Jamestown	6/26	2:45P C.T.	72	35.4	31.1	34.0	36.1	34.0	35.3	36.2	35.0	35.2	36.3	37.8	34.9	37.8	34.0	3.8
Dilworth	6/26	9:40P	65	34.9	33.2	34.5	36.4	34.3	35.3	36.4	34.9	35.1	36.2	37.0	35.0	37.0	34.3	277
Northtown	6/27	8:30A	70	31.4	30.1	32.7	35.1	32.7	34.3	35.1	34.2	34.7	35.2	35.0	34.4	35.2	32.7	2.5
No. LaCrosse	6/27	3:45P	82	34.1	28.5	31.7	32.6	32.4	32.4	33.2	33.2	34.0	32.3	32.0	32.5	34.0	31.7	2.3
Savanna	6/27	9:30P	81	35.3	27.6	31.8	34.1	31.5	32.9	34.2	32.7	33.1	33.9	33.5	32.9	34.2	31.5	2.7
Clearing	6/28	6:00A	80	33.6	29.3	31.2	34.5	31.1	32.9	33.4	31.3	32.9	33.2	33.4	32.6	34.5	31.1	3.4
Hammond	6/28	1:30P	97	35.9	26.5	32.5	34.2	32.3	33.4	34.7	32.2	32.3	32.0	33.1	33.4	34.7	32.0	2.7
Marion	6/29	2:00P E.T.	68	33.9	29.6	31.4	33.7	31.5	33.2	33.7	31.0	34.0	31.9	33.7	32.1	33.7	31.0	2.7
Kent	6/29	8:45A	69	30.0	28.6	31.7	34.0	31.8	33.0	34.2	31.2	31.5	32.7	33.8	32.6	34.2	31.2	3.0
Jamestown	6/29	4:00P	93	32.8	28.9	31.1	33.1	31.3	32.3	33.0	31.3	32.0	32.2	32.8	32.0	33.1	31.1	2.0
Hornell	6/29	9:00P	76	32.2	30.2	30.7	33.5	30.3	32.0	32.8	30.2	31.6	32.2	32.8	31.4	33.5	30.2	3.3
Croxton	6/30	1:30P	88	35.1	31.1	31.9	34.0	31.8	33.0	33.8	31.2	32.5	33.5	33.8	32.6	34.0	31.2	2.8

Table 6. Temperatures in transit

Car N.R.C. 147

Load: Cherries - 1576 lugs - 27,580 lbs.

				Air Temp.		Commodity Temperatures												
				Top	Bot.	Top					Mid.	Bottom						
Station	Date 1942	Time	Out-side Temp.	Bunk C.L.	Bunk C.L.	Bunk C.L.	Bunk Side	Quart. C.L.	Quart. Side	Door C.L.	Quart. C.L.	Bunk C.L.	Bunk Side	Quart. Side	Door C.L.	Max-imum	Min-imum	Spread
Yakima	6/21	4:40P	70	58.3	39.1	49.3	49.3	49.3	50.0	50.1	47.7	48.1	48.6	48.0	47.6	50.1	47.6	2.5
"	6/21	11:25P	56	38.6	41.9	46.4	46.5	44.6	44.4	47.4	45.2	46.8	47.4	46.5	46.6	46.8	44.4	2.4
"	6/22	1:30A	57	31.8	37.6	44.8	44.8	42.7	43.6	46.0	44.2	46.3	48.1	45.7	45.7	48.1	42.7	5.4
"	6/22	3:15A	57	33.1	37.3	43.0	43.3	40.6	40.4	44.4	43.0	45.7	46.3	44.8	44.8	46.3	40.4	5.9
"	6/22	5:00A	57	33.7	36.7	41.1	41.5	38.2	38.2	42.5	41.0	44.5	44.9	43.3	42.8	44.9	38.2	6.7
"	6/22	2:30A	60	32.3	35.3	39.7	39.7	37.0	37.0	40.6	39.5	44.9	43.6	41.8	41.8	44.9	37.0	7.9
"	6/22	9:45A	68	31.5	34.5	38.1	37.8	35.1	35.1	39.2	37.8	41.8	42.1	39.9	39.6	42.1	35.1	7.0
"	6/22	12:30P	80	38.4	28.7	37.6	37.4	35.1	35.0	38.4	37.0	41.6	40.7	39.2	38.6	41.6	35.0	6.5
Pasco	6/22	7:30P	83	41.0	25.2	39.0	39.2	37.2	37.1	39.7	37.2	39.3	38.3	37.8	37.2	39.7	37.1	2.6
Washtucna	6/23	2:00A	67	40.5	23.3	39.8	39.9	38.7	38.3	40.2	37.0	36.5	35.9	36.0	35.8	40.2	35.8	4.4
Yardley	6/23	7:00A	57	39.5	22.3	39.4	39.7	38.5	38.4	39.4	36.4	34.2	34.1	34.6	34.5	39.7	34.1	5.6
Kootenai	6/23	12:45P	66	39.7	23.7	39.5	39.8	38.8	38.5	39.1	36.3	33.1	32.5	33.7	33.4	39.8	32.5	7.3
Paradise	6/23	8:00P P.T.	65	40.6	25.9	39.4	39.5	38.8	38.4	38.4	35.6	31.3	31.3	33.6	32.3	39.5	31.3	8.2
Missoula	6/24	2:20A M.T.	47	40.1	27.3	39.1	39.2	38.7	38.3	38.4	35.0	30.8	30.7	32.2	31.6	39.2	30.7	8.5
Garrison	6/24	7:30A	43	38.8	28.1	38.6	39.3	38.2	37.7	37.6	34.6	30.6	30.4	31.8	31.8	39.3	30.4	8.9
Helena	6/24	1:15P	73	39.2	29.1	38.7	38.5	38.2	38.0	37.8	35.0	31.3	31.2	32.7	32.2	38.7	31.2	7.5
Livingston	6/24	10:30P	60	42.9	30.6	39.6	40.0	39.5	38.8	38.5	34.9	32.1	32.0	33.3	32.8	40.0	32.0	8.0
Laurel	6/25	5:25A	49	41.2	31.5	40.1	39.9	39.8	39.2	39.0	35.0	32.9	32.7	34.3	33.9	40.1	32.7	7.4
Forsyth	6/25	12:45P	77	40.2	31.3	39.8	39.4	39.6	38.8	38.5	35.0	33.3	33.0	34.6	34.6	39.8	33.0	6.8
Marsh	6/25	6:30P	74	42.8	32.1	40.6	39.9	40.1	39.3	39.4	35.6	34.2	33.6	35.0	34.8	40.6	33.6	7.0
Dickinson	6/26	2:30A	59	42.5	32.1	41.1	40.5	40.6	40.0	40.1	35.8	34.1	34.1	35.6	36.0	41.1	34.1	7.0
Mandan	6/26	8:10A C.T.	68	41.4	31.9	41.0	40.6	40.6	39.9	39.7	35.8	34.3	34.3	35.9	36.8	41.0	34.3	6.7
Jamestown	6/26	2:45P	72	42.4	32.4	41.3	40.7	40.9	40.1	40.1	36.1	34.4	34.6	36.5	37.0	41.3	34.4	6.9
Dilworth	6/26	9:40P	65	42.9	32.8	41.4	40.9	41.2	40.1	40.2	36.2	34.9	34.9	36.4	36.4	41.4	34.9	6.5
Northtown	6/27	8:30A	70	41.0	30.9	40.8	40.4	40.7	39.9	39.6	36.0	34.2	34.4	36.1	35.6	41.0	34.2	6.8
No. LaCrosse	6/27	3:45P	82	41.5	31.6	41.5	40.5	41.0	40.2	39.2	36.7	34.5	34.8	36.6	35.6	41.5	34.5	7.0
Savanna	6/27	9:30P	81	43.2	31.7	41.6	41.4	41.7	40.8	40.9	36.7	34.2	34.9	36.3	35.9	41.7	34.2	7.5
Clearing	6/28	6:00A	71	41.8	30.7	41.1	40.5	41.0	40.3	39.9	36.1	33.3	34.0	35.9	35.4	41.1	33.3	7.8
Hammond	6/28	1:30P	97	41.8	29.7	40.8	40.0	40.0	39.6	39.4	36.0	32.9	33.3	34.8	34.6	40.8	32.9	7.9
Marion	6/29	2:00A E.T.	68	45.0	31.9	42.1	41.7	41.4	41.2	40.9	36.5	33.8	33.8	35.8	35.6	42.1	33.8	8.3
Kent	6/29	8:45A	69	42.2	31.1	42.1	42.0	41.4	41.6	41.4	36.1	34.1	34.3	36.3	35.8	42.1	34.1	8.0
Jamestown	6/29	4:00P	93	43.6	31.4	42.1	41.7	41.2	41.4	41.0	36.8	34.1	34.3	36.3	35.8	42.1	34.1	8.0
Hornell	6/29	9:00P	76	45.2	31.9	41.6	42.1	40.8	41.8	41.5	36.0	32.9	34.3	36.0	35.8	42.1	32.9	9.2
Pt. Jervis	6/30	8:30A	70	42.6	32.2	42.6	42.2	42.0	41.7	41.2	35.8	33.9	34.2	35.9	36.0	42.6	33.9	8.7
Croxton	6/30	1:30P	88	43.2	32.9	42.6	42.1	41.3	41.6	41.4	37.1	34.3	34.6	35.4	36.4	42.6	34.3	8.3
Erie Pier	7/1	12:50A	61	45.0	33.9	43.2	42.5	41.9	42.0	42.0	37.2	34.6	35.0	36.4	36.4	43.2	34.6	8.6

Table 7. Temperatures in transit.

Car. N.P. 93588

Load: Cherries - 1576 lugs - 27,580 lbs.

Station	Date 1942	Time	Out-side Temp.	Air Temp. Top Bunk C.L.	Air Temp. Bot. Bunk C.L.	Commodity Temperatures: Top Bunk C.L.	Top Bunk Side	Top Quart. C.L.	Top Quart. Side	Top Door C.L.	Mid. Quart. C.L.	Bottom Bunk C.L.	Bottom Bunk Side	Bottom Quart. Side	Bottom Door C.L.	Max-imum	Min-imum	Spread
Yakima	6/21	10:00P	62	44.2	26.0	40.7	40.0	-	39.5	38.2	39.2	39.4	37.3	40.1	37.7	40.7	35.8	4.9
"	6/22	12:20A	57	40.3	23.8	40.3	39.4	-	39.6	38.4	38.7	38.6	-	39.0	36.9	40.3	35.5	4.8
"	6/22	5:30A	57	38.7	22.0	39.7	39.8	-	39.9	38.4	38.4	35.4	-	37.1	35.3	39.9	35.2	4.7
"	6/22	12:30P	80	37.4	21.1	38.4	39.2	-	38.8	37.4	37.2	30.8	-	33.5	32.4	39.2	30.8	8.4
Pasco	6/22	7:30P	83	39.6	21.3	37.8	38.4	-	38.1	36.9	35.8	28.8	-	32.1	30.4	38.4	28.8	9.6
Washtucna	6/23	2:00A	67	40.0	22.4	37.3	37.8	-	38.2	36.8	34.4	27.9	-	32.1	29.5	38.2	27.9	10.3
Yardley	6/23	7:00A	57	39.0	22.5	36.5	37.0	-	37.8	36.5	33.8	28.3	-	30.5	29.3	37.8	28.3	9.5
Kootenai	6/23	12:45P	66	39.2	24.3	36.7	37.2	-	38.2	37.2	34.0	29.0	-	32.2	30.2	38.2	29.0	9.2
Paradise	6/23	8:00P P.T.	65	40.1	25.5	36.3	37.1	-	39.8	38.7	33.4	29.5	-	34.4	31.6	39.8	29.5	10.3
Missoula	6/24	2:20A M.T.	47	39.0	24.3	35.4	35.5	-	38.1	37.2	32.8	28.6	-	32.9	29.4	38.1	28.6	9.5
Garrison	6/24	7:30A	43	37.3	24.3	35.1	35.2	-	37.7	36.6	32.8	28.6	-	33.4	29.6	37.7	28.6	9.1
Helena	6/24	1:15P	73	37.3	25.3	35.2	35.1	-	37.3	36.5	32.9	28.7	-	34.2	30.0	37.3	28.7	8.6
Livingston	6/24	10:30P	60	41.7	26.3	36.0	35.5	-	38.4	37.7	33.2	29.1	-	35.3	30.2	38.4	29.1	9.3
Laurel	6/25	5:25A	49	39.8	27.3	36.5	36.4	-	39.1	38.3	33.3	29.5	-	36.5	30.6	39.1	29.5	9.6
Forsyth	6/25	12:45P	77	38.3	27.2	36.3	36.0	-	38.6	37.7	34.3	29.1	-	35.8	31.2	38.6	29.1	9.5
Marsh	6/25	6:30P	74	40.6	27.5	36.8	36.5	-	39.0	38.2	33.8	29.6	-	36.5	31.8	39.0	29.6	9.4
Dickinson	6/26	2:30A	59	40.8	27.7	37.3	37.1	-	39.0	38.4	33.8	29.5	-	36.8	32.4	39.0	29.5	9.5
Mandan	6/26	8:10A	68	40.3	27.8	37.3	37.1	-	39.1	38.4	33.9	29.6	-	37.2	32.7	39.1	29.6	9.5
Jamestown	6/26	2:45P C.T.	72	40.8	28.1	38.0	37.6	-	39.3	38.6	34.1	30.2	-	37.7	33.2	39.3	30.2	9.1
Dilworth	6/26	9:40P	65	41.4	28.8	38.3	38.1	-	39.6	39.0	34.2	30.4	-	38.1	33.6	39.6	30.4	9.2
Northtown	6/27	8:30A	70	40.0	27.8	38.3	38.3	-	39.5	39.2	34.7	30.8	-	38.3	34.7	39.5	30.8	8.7
No. LaCrosse	6/27	3:45P	82	41.3	27.6	38.5	38.4	-	39.4	39.4	35.0	30.7	-	38.0	34.6	39.4	30.7	8.7
Savanna	6/27	9:30P	81	42.3	28.3	38.1	38.4	-	39.4	39.4	34.3	30.1	-	37.0	34.4	39.4	30.1	8.3
Clearing	6/28	6:00A	71	41.7	27.7	38.5	37.8	-	39.5	39.2	34.2	29.6	-	36.3	35.1	39.5	29.6	9.9
Hammond	6/28	1:30P	97	41.5	27.6	39.1	38.5	-	39.1	38.7	34.6	29.6	-	35.9	33.5	39.1	29.6	9.5
Marion	6/29	2:00A E.T.	68	44.2	27.7	39.9	39.6	-	40.1	39.9	34.8	29.9	-	35.7	33.4	40.1	29.9	10.1
Kent	6/29	8:45A	69	42.3	27.4	40.1	39.7	-	40.1	40.1	35.4	30.0	-	35.7	34.9	40.1	30.0	10.1
Jamestown	6/29	4:00P	93	43.1	28.3	40.3	39.9	-	40.1	40.0	35.7	30.3	-	35.5	33.6	40.3	30.3	10.0
Hornell	6/29	9:00P	76	44.8	29.3	40.9	40.4	-	40.5	40.5	35.8	30.3	-	35.9	33.9	40.9	30.3	10.6
Pt. Jervis	6/30	8:30A	70	42.6	28.8	40.8	40.4	-	40.8	40.4	35.8	30.3	-	35.9	33.7	40.8	30.3	10.5
Croxton	6/30	1:30P	88	42.8	28.8	41.9	40.3	-	40.6	40.4	36.9	30.7	-	35.6	33.9	41.9	30.7	11.2
Erie Pier	7/1	3:10A	-	44.5	29.7	41.3	40.6	-	41.0	40.9	35.9	30.7	-	36.0	33.6	41.3	30.7	10.6

Table 8. Temperatures in transit.

Car. N.P. 93154 Load: Cherries - 1944 lugs - 34,020 lbs.

				Air Temp.		Commodity Temperatures													
				Top	Bot.	Top					Mid.	Bottom							
Station	Date 1942	Time	Out-side Temp.	Bunk C.L.	Bunk C.L.	Bunk C.L.	Bunk Side	Quart. C.L.	Quart. Side	Door C.L.	Quart. C.L.	Bunk C.L.	Bunk Side	Quart. Side	Door C.L.	Max-imum	Min-imum	Spread
Yakima	6/22	12:50A	58	45.8	30.6	44.1	45.5	45.2	45.9	44.2	45.5	37.5	39.7	42.8	39.3	45.9	37.5	8.4
"	6/22	5:30A	57	44.7	31.2	44.2	45.7	46.4	46.6	45.0	45.4	36.4	38.4	41.1	38.8	46.6	36.4	10.2
"	6/22	12:30P	80	44.3	29.5	44.4	45.8	47.2	46.9	45.5	45.4	35.4	36.8	39.8	38.1	47.2	35.4	11.8
Pasco	6/22	7:30P	83	44.7	29.3	44.2	45.4	47.1	46.5	45.5	44.5	34.2	35.7	38.5	37.1	47.1	34.2	12.9
Washtucna	6/23	2:00A	67	-	-	44.2	-	47.1	-	-	43.6	-	-	-	-	47.1	-	-
Yardley	6/23	7:00A	57	44.8	29.7	44.0	45.0	46.8	45.9	45.7	43.2	32.6	35.0	36.8	36.2	46.8	32.6	14.2
Kootenai	6/23	12:45P	66	43.1	29.2	43.6	44.4	46.2	45.6	45.3	42.5	32.4	34.5	36.6	36.1	46.2	32.4	13.8
Paradise	6/23	8:00P P.T.	65	43.2	30.1	42.7	43.4	45.2	44.7	44.5	41.5	31.5	33.8	35.8	35.5	45.2	31.5	13.7
Missoula	6/24	2:20A M.T.	47	42.4	30.5	42.3	42.8	43.9	44.5	44.3	40.8	31.6	33.8	35.8	35.6	44.5	31.4	12.9
Garrison	6/24	7:30A	43	40.7	29.3	41.4	41.6	43.8	43.2	43.6	39.8	31.4	33.5	34.8	34.3	43.8	31.4	12.4
Helena	6/24	1:15P	73	40.7	29.3	41.3	41.6	43.4	43.2	43.2	39.6	31.4	33.7	35.5	35.6	43.4	31.4	12.0
Livingston	6/24	10:30P	60	43.7	30.0	41.2	41.6	43.3	42.9	42.8	39.3	31.5	33.2	34.9	35.2	43.3	31.5	11.8
Laurel	6/25	5:25A	49	42.8	31.0	41.2	41.5	43.1	42.9	43.0	39.0	32.6	33.3	34.9	35.8	43.1	32.6	10.5
Forsyth	6/25	12:45P	77	40.7	30.7	40.3	40.4	42.2	42.0	42.1	38.4	31.7	32.9	34.8	35.9	42.2	31.7	10.5
Marsh	6/25	6:30P	74	41.8	30.3	40.7	40.6	42.3	42.0	42.3	38.6	32.3	33.2	35.1	36.1	42.3	32.3	10.0
Dickinson	6/26	2:30A	59	41.5	28.1	40.2	40.4	41.9	41.4	41.8	37.9	32.0	33.0	34.7	35.8	41.9	32.0	9.9
Mandan	6/26	8:10A C.T.	68	40.7	27.6	40.2	40.3	41.7	40.9	41.8	37.7	31.5	32.7	34.6	35.3	41.8	31.5	10.3
Jamestown	6/26	2:45P	72	40.5	27.3	40.0	40.1	41.3	40.5	41.4	37.4	31.1	32.3	34.0	34.9	41.4	31.1	10.3
Dilworth	6/26	9:40P	65	41.7	27.5	39.7	39.8	41.0	39.9	41.1	37.0	30.5	31.5	33.1	34.0	41.1	30.5	10.6
Northtown	6/27	8:30A	70	40.7	28.3	39.4	39.6	40.9	39.9	40.8	36.9	30.7	31.4	33.4	34.1	40.9	30.7	10.2
No. LaCrosse	6/27	3:45P	82	42.2	29.3	41.0	39.9	41.2	40.0	41.1	37.4	30.8	31.7	33.4	34.1	41.2	30.8	10.4
Savanna	6/27	9:30P	81	42.5	29.3	39.6	40.7	41.4	40.4	41.1	37.0	30.4	31.7	33.6	34.1	41.4	30.4	11.0
Clearing	6/28	6:00A	71	40.9	27.5	39.6	40.5	40.5	40.1	41.3	36.0	30.4	31.0	33.2	33.6	41.3	30.4	10.7
Hammond	6/28	1:30P	97	41.9	27.6	39.3	40.4	40.5	40.1	40.7	35.9	29.5	30.9	32.8	33.4	40.7	29.5	11.2
Marion	6/29	2:00A E.T.	68	45.5	29.5	41.7	42.6	42.0	41.9	42.6	37.3	30.9	32.2	33.6	33.9	42.6	30.9	11.7
Kent	6/29	8:45A	69	43.5	29.3	41.4	42.3	42.2	41.9	42.1	37.1	30.3	31.7	33.8	33.9	42.3	30.3	12.0
Jamestown	6/29	4:00P	93	43.8	28.8	40.9	42.0	41.8	41.5	41.9	36.9	29.8	31.7	33.5	33.3	42.0	29.8	12.2
Hornell	6/29	9:00P	76	44.6	29.3	41.3	42.2	42.0	41.5	41.7	36.7	30.0	31.5	33.3	33.0	42.2	30.0	12.2
Pt. Jervis	6/30	8:30A	70	43.2	29.7	41.8	42.9	42.3	42.1	42.1	36.9	30.3	32.1	33.4	33.1	42.9	30.3	12.6
Croxton	6/30	1:30P	88	42.6	30.3	41.2	42.0	41.8	41.8	41.6	36.6	30.3	31.9	33.3	33.1	42.0	30.3	11.7
Erie Pier	7/1	12:30A	66	44.5	31.9	41.4	42.8	41.9	42.1	41.9	36.8	29.9	31.9	33.8	33.8	42.8	29.9	12.9

Table 9. Temperatures in transit.

Car N.R.C. 204

Load: Cherries - 1584 lugs - 27,720 lbs.

				Air Temp.		Commodity Temperatures												
				Top	Bot.	Top					Mid.	Bottom						
Station	Date 1942	Time	Out-side Temp.	Bunk C.L.	Bunk C.L.	Bunk C.L.	Bunk Side	Quart. C.L.	Quart. Side	Door C.L.	Quart. C.L.	Bunk C.L.	Bunk Side	Quart. Side	Door C.L.	Max-imum	Min-imum	Spread
Yakima	6/22	1:45A	57	38.6	31.9	32.9	35.1	32.6	33.9	33.0	32.8	34.6	34.5	34.0	33.7	35.1	32.6	2.5
"	6/22	5:25A	57	37.5	29.6	34.5	36.4	34.8	34.9	33.5	34.0	35.5	35.3	35.5	34.2	36.4	33.5	2.9
"	6/22	12:30P	80	35.4	26.5	35.4	36.7	34.7	35.2	33.0	34.3	34.7	34.6	35.6	33.9	36.7	33.0	3.7
Pasco	6/22	7:30P	83	36.2	25.9	34.7	37.3	35.6	36.2	34.6	35.8	34.2	33.8	35.3	34.0	37.3	33.8	3.5
Yardley	6/23	7:00A	57	34.2	23.4	36.1	36.2	35.1	35.7	32.9	34.6	30.9	30.6	33.4	33.0	36.2	30.6	5.6
Kootenai	6/23	12:45P	66	33.4	21.1	35.3	35.4	34.6	35.0	32.4	34.4	29.7	29.6	31.8	32.8	35.4	29.6	5.8
Paradise	6/23	8:00P P.T.	65	34.2	21.1	34.8	35.1	34.3	34.9	32.0	33.7	28.3	27.8	29.9	32.2	35.1	27.8	7.3
Missoula	6/24	2:20A M.T.	47	33.6	21.8	34.6	34.8	34.2	34.5	31.6	33.0	27.2	26.8	29.3	31.8	34.8	26.8	8.0
Garrison	6/24	7:30A	43	33.4	22.4	34.0	34.0	33.6	34.0	30.8	32.0	26.7	26.0	28.5	31.3	34.0	26.0	8.0
Helena	6/24	1:15P	73	33.5	24.5	34.1	34.3	33.8	34.1	31.1	32.8	27.5	27.0	28.8	31.8	34.3	27.0	7.3
Livingston	6/24	10:30P	60	37.3	26.1	34.7	34.7	34.9	34.6	32.4	32.6	28.1	27.9	29.3	31.7	34.9	27.9	7.0
Laurel	6/25	5:25A	49	36.2	27.3	35.1	35.1	35.2	34.9	33.0	32.8	28.6	28.6	30.2	32.0	35.2	28.6	6.6
Forsyth	6/25	12:45P	77	36.1	28.1	35.0	34.7	35.2	35.0	32.9	32.9	28.9	28.8	31.2	32.6	35.2	28.8	6.4
Marsh	6/25	6:30P	74	38.2	28.9	35.5	35.5	36.2	36.1	33.9	33.7	29.7	29.7	32.5	33.0	36.2	29.7	6.5
Dickinson	6/26	2:30A	59	38.0	29.5	36.4	36.1	37.0	36.9	34.8	34.0	30.4	30.8	33.9	33.6	37.0	30.4	6.6
Mandan	6/26	8:10A C.T.	68	37.5	29.6	37.4	36.3	37.0	37.2	34.9	34.4	30.7	31.4	34.5	33.8	37.4	30.7	6.7
Jamestown	6/26	2:45P	72	38.0	29.8	36.7	36.4	37.3	37.5	35.0	34.7	31.5	32.0	34.8	34.4	37.5	31.5	6.0
Dilworth	6/26	9:40P	65	38.8	30.2	37.2	37.2	37.8	38.0	35.8	35.4	32.2	32.8	35.5	34.9	38.0	32.2	5.8
Northtown	6/27	8:30A	70	37.7	29.9	37.2	37.1	37.3	37.7	35.8	35.4	32.4	32.8	35.3	35.4	37.7	32.4	5.3

Table 10. Temperatures in transit.

Car N.P. 92069 Load: Cherries - 1576 lugs - 27,580 lbs.

				Air Temp.		Commodity Temperatures												
						Top					Mid.	Bottom						
Station	Date 1942	Time	Out-side Temp.	Top Bunk C.L.	Bot. Bunk C.L.	Bunk C.L.	Bunk Side	Quart. C.L.	Quart. Side	Door C.L.	Quart. C.L.	Bunk C.L.	Bunk Side	Quart. Side	Door C.L.	Max-imum	Min-imum	Spread
Yakima	6/21	8:50P	67	34.0	32.3	34.5	34.4	33.2	34.6	33.4	34.0	33.0	34.5	31.9	32.7	34.6	31.9	2.7
"	6/22	12:30A	57	43.7	31.6	36.5	34.9	35.7	35.8	35.1	34.7	34.2	34.0	33.3	34.2	35.8	33.3	2.5
"	6/22	5:30A	57	42.5	27.3	38.1	37.2	37.7	37.5	37.5	35.8	35.2	34.5	35.1	36.0	38.1	34.5	3.6
"	6/22	12:30P	80	41.1	22.5	39.3	38.5	39.0	38.8	38.6	37.0	35.3	32.2	35.9	36.9	39.3	32.2	7.1
Pasco	6/22	7:30P	83	29.2	27.5	37.4	37.2	36.7	36.3	36.6	36.6	34.2	31.0	34.3	34.2	37.4	31.0	6.4
Yardley	6/23	6:45A	57	29.8	27.0	34.0	34.3	32.2	32.3	33.3	32.2	32.2	30.4	32.1	31.4	34.3	30.4	3.9
Kootenai	6/23	12:45P	66	27.5	25.4	32.5	33.2	31.0	31.3	32.4	31.2	31.7	30.1	31.8	30.1	33.2	30.1	3.1
Paradise	6/23	8:00P P.T.	65	29.2	25.4	31.5	31.4	29.2	30.1	30.6	29.7	30.8	29.6	30.7	29.1	31.5	29.1	2.4
Missoula	6/24	2:20A M.T.	47	25.6	27.3	30.9	31.4	28.7	29.5	30.5	29.5	30.4	30.0	30.5	28.5	31.4	28.5	2.9
Garrison	6/24	7:30A	43	24.7	27.1	30.0	30.2	27.9	29.0	29.4	28.5	29.8	29.8	30.1	27.7	30.2	27.7	2.5
Helena	6/24	1:15P	73	26.2	26.8	29.6	29.8	27.7	29.1	29.3	28.3	29.5	29.9	30.2	27.3	30.2	27.3	2.9
Livingston	6/24	10:30P	60	33.2	28.8	30.4	30.6	28.8	30.6	30.0	28.8	29.9	30.2	31.3	28.0	31.3	28.0	3.3
Laurel	6/25	5:25A	49	32.0	30.5	31.5	31.5	29.7	31.4	30.6	29.5	30.2	31.1	32.3	28.6	32.3	28.6	3.7
Forsyth	6/25	12:45P	77	31.2	29.8	31.5	31.9	29.9	31.5	30.6	29.7	30.5	31.6	32.4	29.2	32.4	29.2	3.2
Marsh	6/25	6:30P	74	33.8	30.6	32.1	32.4	30.7	32.3	31.1	30.0	31.2	32.1	33.1	29.6	33.1	29.6	3.5
Dickinson	6/26	2:30A	59	34.2	31.6	32.4	33.4	31.7	33.2	32.1	30.8	31.8	33.2	34.0	30.3	34.0	30.3	3.7
Mandan	6/26	8:10A	68	35.2	32.2	33.2	34.2	32.3	33.6	32.4	31.5	32.3	33.8	34.5	31.0	34.5	31.0	3.5
Jamestown	6/26	2:45P C.T.	72	35.2	32.6	33.6	34.4	32.6	34.0	32.6	32.0	32.7	34.2	35.0	31.5	35.0	31.5	3.5
Dilworth	6/26	9:40P	65	35.3	33.2	34.3	35.2	33.5	34.5	33.4	32.7	33.3	34.8	35.4	33.0	35.4	32.7	2.7
Northtown	6/27	8:30A	70	31.2	30.3	34.0	34.9	32.1	33.5	32.6	32.1	33.8	34.6	34.7	33.9	34.9	32.1	2.8
No. LaCrosse	6/27	3:45P	82	29.7	30.7	33.4	35.3	31.3	32.7	31.6	31.7	33.5	34.1	33.9	30.7	35.3	30.7	4.6
Savanna	6/27	9:30P	81	32.2	27.6	31.6	32.5	29.7	31.3	30.9	30.2	31.7	33.1	32.3	29.5	33.1	29.5	3.6
Clearing	6/28	6:00A	71	33.2	29.6	31.6	33.4	29.7	31.7	31.0	30.2	32.2	33.0	32.0	29.7	33.4	29.7	3.7
Hammond	6/28	1:30P	97	35.4	27.5	32.5	33.5	31.6	32.9	32.1	30.3	31.3	32.3	32.3	30.2	33.5	30.2	3.3
Marion	6/29	2:00A E.T.	68	34.0	29.0	31.8	33.2	30.2	32.1	31.4	29.9	31.0	32.5	32.5	29.9	33.2	29.9	3.3
Kent	6/29	8:45A	69	31.3	28.5	32.0	33.1	30.1	32.0	31.6	29.7	31.4	32.7	32.7	30.2	33.1	29.7	3.4
Jamestown	6/29	4:00P	93	30.4	30.3	31.2	32.5	29.1	31.0	31.2	29.3	30.7	32.2	32.0	29.8	32.5	29.1	3.4
Hornell	6/29	9:00P	76	34.3	30.1	31.5	32.8	29.7	31.3	31.1	29.7	30.9	33.0	32.3	30.0	33.0	29.7	3.3
Pt. Jervis	6/30	8:30A	70	29.7	29.6	32.2	32.4	29.6	31.0	31.1	29.6	30.7	32.5	31.8	30.2	32.5	29.6	2.9
Croxton	6/30	1:30P	88	30.3	30.3	31.5	82.4	29.7	31.2	31.2	29.4	31.8	32.7	31.8	30.2	32.7	29.4	3.3

Table 11. Comparison of commodity temperatures in all cars during transit.

Station	Date	Time	Top Bunker Center Car Number							Bottom Bunker Center Car Number						
			N.P. 92035	N.P. 92140	N.R.C. 147	N.P. 93588	N.P. 93154	N.R.C. 204	N.P. 92069	N.P. 92035	N.P. 92140	N.R.C. 147	N.P. 93588	N.P. 93154	N.R.C. 204	N.P. 92069
Yakima	6/21	1:10P	35.2							33.0						
"	6/22	12:50A	37.8	42.3	44.8	40.3	44.1	32.9	36.5	30.9	37.2	46.3	38.6	37.5	34.6	34.2
"	"	5:20A	38.2	42.9	41.1	39.7	44.2	34.5	38.1	30.0	35.8	44.5	35.4	36.4	35.5	35.2
"	"	12:30P	38.7	44.1	37.6	38.4	44.4	35.4	39.3	29.7	33.8	41.6	30.8	35.4	34.7	35.3
Pasco	"	7:30P	36.6	42.7	39.0	37.8	44.2	34.7	37.4	30.4	34.2	39.3	28.8	34.2	34.2	34.2
Washtucna	6/23	2:00A	35.8	41.7	39.8	37.3	44.2	-	-	30.9	35.0	36.5	27.9	-	-	-
Yardley	"	7:00A	35.0	41.2	39.4	36.5	44.0	36.1	34.0	32.0	35.7	34.2	28.3	32.6	30.9	32.2
Kootenai	"	12:45P	35.0	39.5	39.5	36.7	43.6	35.3	32.5	33.0	36.8	33.1	29.0	32.4	29.7	31.7
Paradise	"	8:00P	34.4	38.2	39.4	36.3	42.7	34.8	31.5	33.6	37.0	31.3	29.5	31.5	28.3	30.8
Missoula	6/24	2:20A M.T.	34.0	37.0	39.1	35.4	42.3	34.6	30.9	33.6	36.6	30.8	28.6	31.6	27.2	30.4
Garrison	"	7:30A	33.7	37.0	38.6	35.1	41.4	34.0	30.0	34.0	37.0	30.6	28.6	31.4	26.0	29.8
Helena	"	1:15P	34.0	36.7	38.7	35.2	41.3	34.1	29.6	34.1	36.9	31.3	28.7	31.4	27.5	29.5
Livingston	"	10:30P	34.6	37.1	39.6	36.0	41.2	34.7	30.4	34.7	37.3	32.1	29.1	31.5	28.1	29.9
Laurel	6/25	5:25A	35.4	37.3	40.1	36.5	41.2	35.1	31.5	35.5	37.4	32.9	29.5	32.6	28.6	30.2
Forsythe	"	12:45P	34.4	35.8	39.8	36.3	40.3	35.0	31.5	35.0	37.0	33.3	29.1	31.7	28.9	30.5
Marsh	"	6:30P	34.4	35.4	40.6	36.8	40.7	35.5	32.1	35.1	36.7	34.2	29.6	32.3	29.7	31.2
Dickenson	6/26	2:30A	34.1	34.8	41.1	37.3	40.2	36.4	32.4	34.7	36.0	34.1	29.5	32.0	30.4	31.8
Mandan	"	8:10A	34.2	34.3	41.0	37.3	40.2	37.4	33.2	34.9	35.7	34.3	29.6	31.5	30.7	32.3
Jamestown	"	2:45P C.T.	34.1	34.0	41.3	38.0	40.0	36.7	33.6	34.8	35.2	38.4	30.2	31.1	31.5	32.7
Dilworth	"	9:40P	34.6	34.5	41.4	38.3	39.7	37.2	34.3	35.3	35.1	34.9	30.4	30.5	32.2	33.3
Northtown	6/27	8:30A	32.9	32.7	40.8	38.3	39.4	37.2	34.0	34.6	34.7	34.2	30.8	30.7	32.4	33.8
N. La Crosse	"	3:45P	33.1	31.7	41.5	38.5	41.0	-	33.4	34.6	34.0	34.5	30.7	30.8	-	33.5
Savanna	"	9:30P	31.6	31.8	41.6	38.1	39.6	-	31.6	32.5	33.1	34.2	30.1	30.4	-	31.7
Clearing	6/28	6:00A	32.4	31.2	41.1	38.5	39.6	-	31.6	32.9	32.9	33.3	29.6	30.4	-	32.2
Hammond	"	1:30P	32.7	32.5	40.8	39.1	39.3	-	32.5	33.4	32.3	32.9	29.6	29.5	-	31.3
Marion	6/29	2:00A E.T.	32.1	31.4	42.1	39.9	41.7	-	31.8	32.1	31.0	33.8	29.9	30.9	-	31.0
Kent	"	8:45A	31.9	31.7	42.1	40.1	41.4	-	32.0	32.0	31.5	34.1	30.0	30.3	-	31.4
Jamestown	"	4:00P	31.4	31.1	42.1	40.3	40.9	-	31.2	31.4	32.0	34.1	30.3	29.8	-	30.7
Hornell	"	9:00P	31.6	30.7	41.6	40.9	41.3	-	31.5	31.8	31.6	32.9	30.3	30.0	-	30.9
Pt. Jervis	6/30	8:30A	32.3	-	42.6	40.8	41.8	-	32.2	31.9	-	33.9	30.3	30.3	-	30.7
Croxton	"	1:30P	32.5	31.9	42.6	41.9	41.2	-	31.5	31.8	32.5	34.3	30.7	30.3	-	31.8
Erie Pier	7/1	3:00A	35.8	-	43.2	41.3	41.4	-	-	32.0	-	34.6	30.7	29.9	-	-

Station	Date	Time	Top Doorway Center Car Number							Bottom Doorway Center Car Number						
			N.P. 92035	N.P. 92140	N.R.C. 147	N.P. 93588	N.P. 93154	N.R.C. 204	N.P. 92069	N.P. 92035	N.P. 92140	N.R.C. 147	N.P. 93588	N.P. 93154	N.R.C. 204	N.P. 92069
Yakima	6/21	1:10P	35.3							34.4						
"	6/22	12:50A	37.9	40.5	46.0	38.4	44.2	33.0	35.1	32.4	38.7	45.7	36.9	39.3	33.7	34.2
"	"	5:20A	38.6	41.8	42.5	38.4	45.0	33.5	37.5	31.6	38.1	42.8	35.3	38.8	34.2	36.0
"	"	12:30P	39.1	43.2	38.4	37.4	45.5	33.0	38.6	31.6	37.0	38.6	32.4	38.1	33.9	36.9
Pasco	"	7:30P	38.0	42.2	39.7	36.9	45.5	34.6	36.6	32.0	36.0	37.2	30.4	37.1	34.0	34.2
Washtucna	6/23	2:00A	37.7	42.2	40.2	36.8	-	-	-	32.7	36.2	35.8	29.5	-	-	-
Yardley	"	7:00A	37.2	41.2	39.4	36.5	45.7	32.9	33.3	33.4	36.4	34.5	29.3	36.2	33.0	31.4
Kootenai	"	12:45P	37.0	41.0	39.1	37.2	45.3	32.4	32.4	34.0	37.2	33.4	30.2	36.1	32.8	30.1
Paradise	"	8:00P	36.4	39.9	38.4	38.7	44.5	32.0	30.6	33.9	37.0	32.3	31.6	35.5	32.2	29.1
Missoula	6/24	2:20A M.T.	35.5	39.1	38.4	37.2	44.3	31.6	30.5	33.7	36.5	31.6	29.4	35.6	31.8	28.5
Garrison	"	7:30A	35.4	38.9	37.6	36.6	43.6	30.8	29.4	34.4	36.6	31.8	29.6	34.3	31.3	27.0
Helena	"	1:15P	35.5	38.3	37.8	36.5	43.2	31.1	29.3	34.0	36.5	32.2	30.0	35.6	31.8	27.3
Livingston	"	10:30P	35.7	39.0	38.5	37.7	42.8	32.4	30.0	34.5	37.1	32.8	30.2	35.2	31.7	28.0
Laurel	6/25	5:25A	36.6	39.2	39.0	38.3	43.0	33.0	30.2	35.6	37.4	33.9	30.6	35.8	32.0	28.6
Forsythe	"	12:45P	35.5	38.2	38.5	37.7	42.1	32.9	30.6	34.5	37.1	34.6	31.2	35.9	32.6	29.2
Marsh	"	6:30P	35.4	37.3	39.4	38.2	42.3	33.9	30.6	34.0	36.4	34.8	31.8	36.1	33.0	29.6
Dickenson	6/26	2:30A	35.3	37.2	40.1	38.4	41.8	34.8	31.1	34.0	35.4	36.0	32.4	35.8	33.6	30.3
Mandan	"	8:10A	35.3	36.5	39.7	38.4	41.8	34.9	32.1	34.1	35.1	36.8	32.7	35.3	33.8	31.0
Jamestown	"	2:45P C.T.	35.2	36.2	40.1	38.6	41.4	35.0	32.4	34.2	34.9	37.0	33.2	34.9	34.4	31.5
Dilworth	"	9:40P	35.5	36.4	40.2	39.0	41.4	35.8	33.4	34.4	35.0	36.4	33.6	34.0	34.9	33.0
Northtown	6/27	8:30A	34.3	35.1	39.6	39.2	40.8	35.8	32.6	33.0	34.4	35.6	34.7	34.1	35.4	33.9
N. La Crosse	"	3:45P	34.0	33.2	39.2	39.4	41.1	-	31.6	32.6	32.5	35.6	34.6	34.1	-	30.7
Savanna	"	9:30P	32.5	34.2	40.9	39.4	41.1	-	30.9	31.1	32.9	35.9	34.4	34.1	-	29.5
Clearing	6/28	6:00A	33.3	33.4	39.9	39.2	41.3	-	31.0	31.9	32.6	35.4	35.1	33.6	-	29.7
Hammond	"	1:30P	34.0	34.7	39.4	38.7	40.7	-	32.1	31.9	33.4	34.6	33.5	33.4	-	30.2
Marion	6/29	2:00A E.T.	34.1	33.7	40.9	39.9	42.6	-	31.4	32.1	38.1	35.6	33.4	33.9	-	29.9
Kent	"	8:45A	32.9	34.2	41.4	40.1	42.1	-	31.6	32.1	32.6	35.8	34.9	33.9	-	30.2
Jamestown	"	4:00P	32.7	33.0	41.0	40.0	41.9	-	31.2	31.2	32.0	35.8	33.6	33.3	-	29.8
Hornell	"	9:00P	32.7	32.8	41.5	40.5	41.7	-	31.1	31.4	31.4	35.8	33.9	33.0	-	30.0
Pt. Jervis	6/30	8:30A	34.0	-	41.2	40.4	42.1	-	31.1	32.1	-	36.0	33.7	33.1	-	30.2
Croxton	"	1:30P	34.2	33.8	41.4	40.4	41.6	-	31.2	32.8	32.6	36.4	33.9	33.1	-	30.2
Erie Pier	7/1	3:00A	36.0	-	42.0	40.9	41.9	-	-	33.8	-	36.4	33.6	33.8	-	-

Table 12. Mean fruit temperatures at various positions in the cars[1/].

Car number	Top layer					Mid. layer	Bottom layer			
	Bunker		Quarter-length		Doorway	Quarter-length	Bunker		Quarter-length	Doorway
	Center line	South side	Center line	South side	Center line	Center line	Center line	South side	South side	Center line
				Fan freight cars						
N.P. 92035	33.5	35.3	-	34.4	34.8	33.4	33.6	34.5	33.1	33.2
N.P. 92140	34.5	36.4	34.4	35.5	36.5	34.7	34.8	35.0	36.1	34.8
N.P. 92069*	32.0	32.8	30.3	31.7	31.4	30.3	31.4	32.1	32.5	30.0
				Standard freight cars						
N.P. 93588*	37.9	37.7	-	39.2	38.6	34.2	29.7	-	35.7	32.5
N.P. 93154*	41.0	41.5	42.5	42.0	42.4	38.3	31.1	32.6	34.3	34.6
				Standard express cars						
N.R.C. 147	40.7	40.5	40.2	39.8	39.7	35.9	33.3	33.5	35.0	34.8
N.R.C. 204*	35.6	35.5	35.6	35.7	33.3	33.8	29.5	29.5	31.9	33.0

1/ From data taken between Yardley (Spokane) and Croxton (Jersey City), inclusive, June 22 to 30, 1942. The means were computed from 25 readings, with the following exceptions: 24 readings were taken in N.P. 92140, and 15 readings were taken in N.R.C. 204 (diverted at Minneapolis).

* The cars marked with an asterisk contained dry ice in the doorway bracing near the top of the load.

Table 13. Percent carbon dioxide in test cars loaded with sweet cherries.

Station	Date 1942	Hrs. Enroute	Car number N.P. 93588	N.P. 93154	N.R.C. 204	N.P. 92609	Remarks
			Percent carbon dioxide				
Yakima	June 22	Start	26	26	20	17	14 to 18 hrs, after charging.
Pasco	" 22	4	24	24	17	16½	
Yardley	" 23	16	27	27	17½	14½	
Paradise	" 23	28½	22	27	15	10	
Garrison	" 24	39½	24	30	18	11	Climbing Contl Divide
Livingston	" 24	54½	23	29½	18	10	
Laurel	" 25	61	19	28½	17	8	Before recharging
"	" 25	62	200 lbs. "Dry Ice" added to each car.				Unbroken cakes - 50 lbs. per hatch.
"	" 25	64	25	30	23	15	2 hrs. after recharging.
Forsyth	" 25	68	25	28½	21½	10	
Glendive	" 25	76	20	27½	16	8½	
Mandan	" 26	87	15½	27	14	6	
Dilworth	" 26	101	13½	24½	13	6	
Northtown	" 27	112	9	13	9	3	N.R.C. 204 Diverted.
N. La Crosse	" 27	118½	4½	12		2	
Clearing	" 28	132	3½	7		Trace	Before recharging.
"	" 28	134	200 lbs. "Dry Ice" added to each car.				Unbroken cakes - 50 lbs. per hatch.
"	" 28	136	13½	16		7	2 hrs. after recharging.
"	" 28	137½	15½	17		9	3½ hrs. " "
Hammond	" 28	140	19	20		10½	
Marion	" 29	152	19	16		5	
Kent	" 29	159½	14	14		4	
Hornell	" 29	172	9	7		2	
Port Jervis	" 30	183½	4½	5		1	
Croxton Yds.	" 30	187½	4	4		1	

Table 14. Condition of fruit in test boxes at New York, July 1-3, 1942.

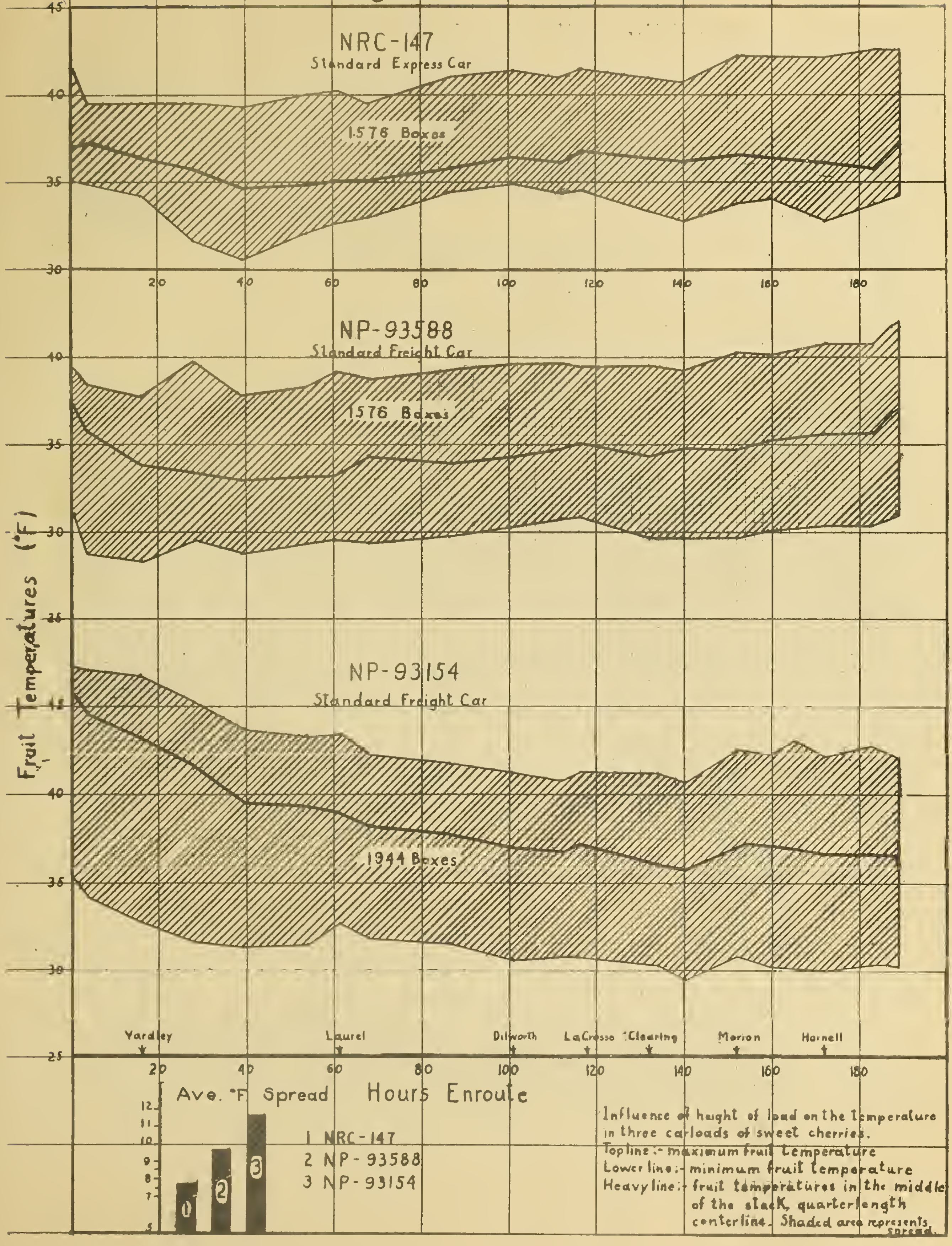
Car number	Type of car and load	Non-inoculated cherries: Same day unloaded — Condition of fruit and stems	Two days after unloading — Condition of fruit and stems	Percent weight loss	Average percent decay[1/] Green mold	Blue mold	Unknown	Total
N.P. 92035	Fan car 34,020 lb. load No dry ice.	Second darkest in color. Stems mostly green, rather dry.	Brighter than N.R.C. 147. Stems fairly green with some browning at tip.	-	3.5	1.8	5.0	10.3
N.P. 92140	Fan car. 27,580 lb. load No dry ice.	Slightly lighter in color than N.P. 92035. Stems about same.	Same as N.P. 92069	4.82	2.0	5.4	5.5	12.9
N.R.C. 147	Standard express 27,580 lb. load No dry ice.	Fruit darkest of any lot. Stems dry, mostly brown.	Darkest color of any lot. Stems dry and brown. Fair appearance.	5.18	1.3	9.3	8.5	19.1
N.P. 93588	Standard freight 27,580 lb. load. Dry ice.	Not quite as bright as N.P. 92069. Stems mostly green, rather dry.	Same as N.P. 92069	4.20	1.1	1.1	3.8	6.0
N.P. 93154	Standard freight 34,020 lb. load. Dry ice.	Same as N.P. 93588	Same as N.P. 92069	-	0.5	3.5	4.1	8.1
N.R.C. 204	Fan car. 27,720 lb. load Dry ice	Same as N.P. 93588	Same as N.P. 92069	-	0.4	0.7	2.9	4.0
N.P. 92069	Fan car. 27,580 lb. load Dry ice.	Fruit brightest in color. Stems mostly green, rather dry.	Good appearance, bright. No low temperature injury, firm. Stems same as N.P. 92035.	4.00	1.4	0.8	4.6	6.8

Inoculated cherries - Average percent Decay[2/]

		Same day unloaded — Green mold[3/]	Same day unloaded — Brown rot[4/]	One day after unloading — Green mold[3/]	One day after unloading — Brown rot[4/]
N.P. 92035	-	72.0	None	96.0	77.7
N.P. 92140	-	85.5	"	98.8	80.2
N.R.C. 147	-	88.3	"	92.1	92.2
N.P. 93588	-	9.4	"	69.8	78.3
N.P. 93154	-	6.8	"	66.3	75.5
N.R.C. 204	-	9.5	"	77.3	59.3
N.P. 92069	-	4.2	"	86.9	70.5

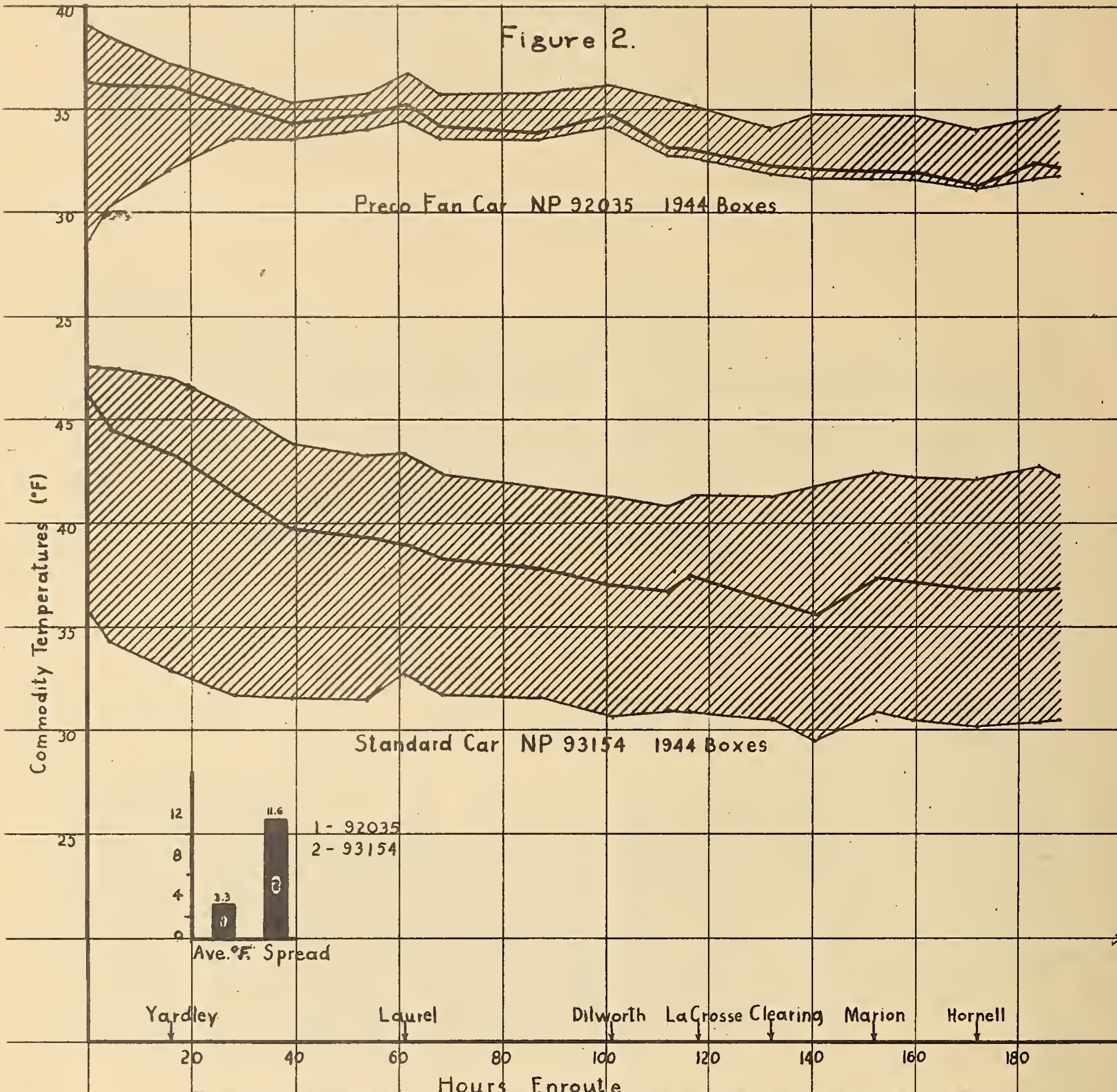
1/ Average of three 1000 gram samples from each box.
2/ " " two 500 " " " " "
3/ _Cladosporium_ sp. originally isolated from a decayed cherry.
4/ _Sclerotinia fructicola_ (Wint.) Rehm.

Figure 1.

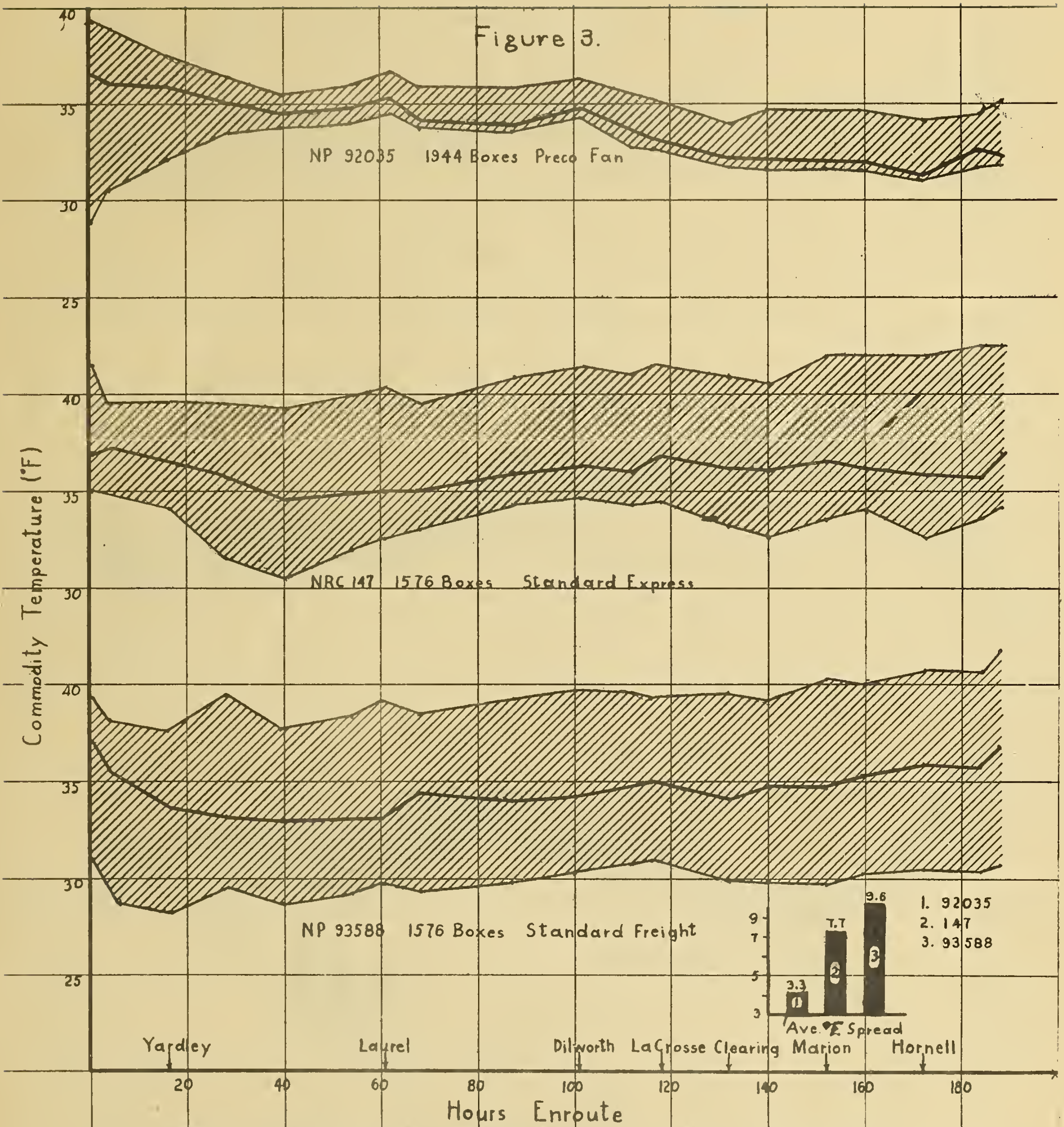


NRC-147
Standard Express Car
1576 Boxes
NP-93588
Standard Freight Car
1576 Boxes
NP-93154
Standard Freight Car
1944 Boxes
Fruit Temperatures (°F)
45
40
35
30
25
20
40
60
80
100
120
140
160
180
Yardley
Laurel
Dilworth
LaCrosse
Clearing
Marion
Hornell
Ave. °F Spread
Hours Enroute
1 NRC-147
2 NP-93588
3 NP-93154
Influence of height of load on the temperature in three carloads of sweet cherries.
Topline:- maximum fruit temperature
Lower line:- minimum fruit temperature
Heavy line:- fruit temperatures in the middle of the stack, quarterlength centerline. Shaded area represents spread.

Figure 2.

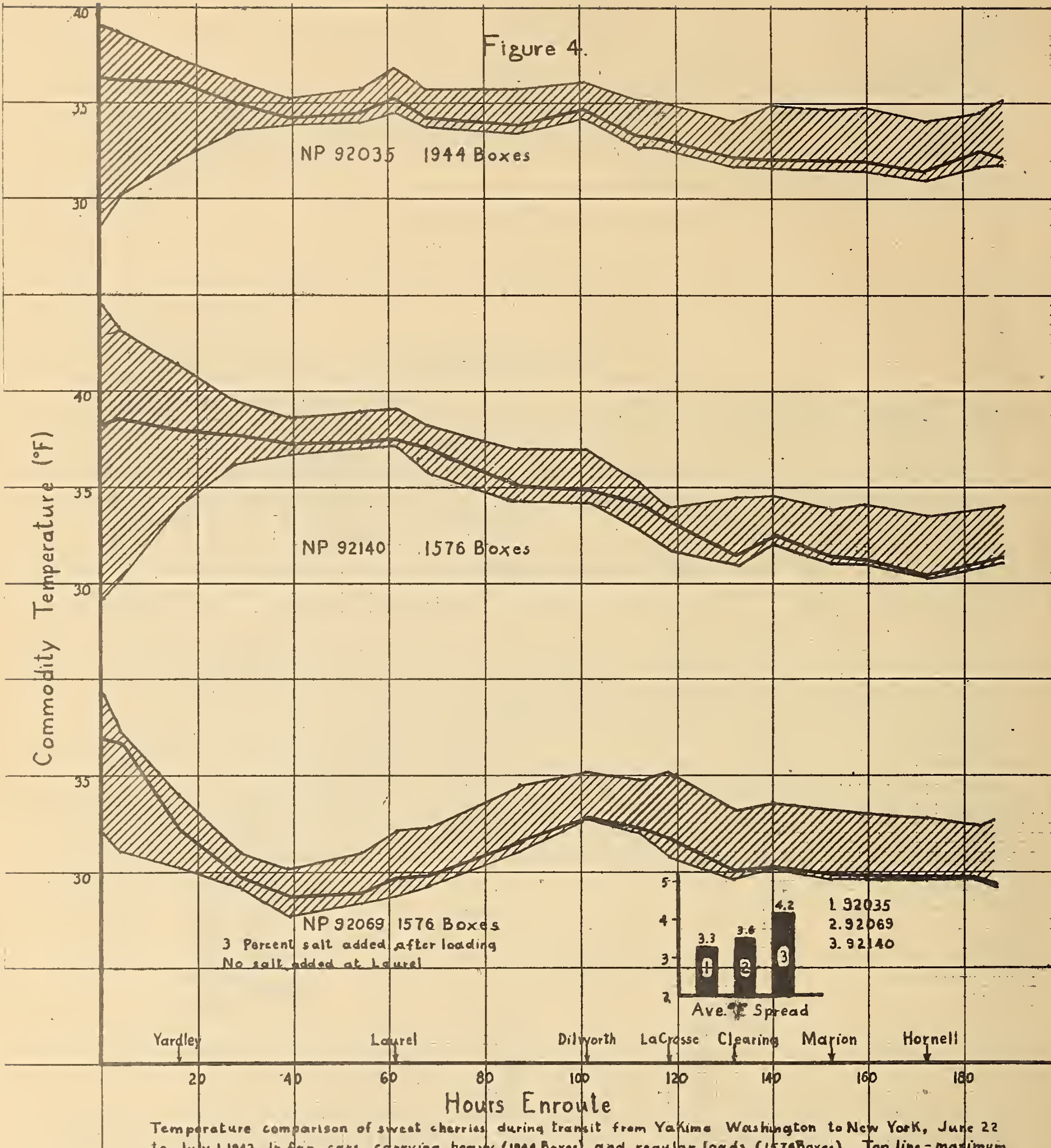


Temperature spread, during transit from Yakima, Washington to New York, June 22 to July 1, 1942, in heavy loads (1944Boxes) of sweet cherries as influenced by "mechanical circulation of air". Top line - maxium fruit temperature, Lower line - minimum fruit temperature, Shaded area represents the spread. Heavy line - fruit temperature in the middle of the stack, quarterlength, centerline position in the car.



Temperature comparison of a heavy load (1944 Boxes) in a fan car with regular loads of 1576 boxes in standard freight and express cars during transit from Yakima, Washington to New York, June 22 to July 1, 1942. Top line - maximum fruit temperature. Lower line - minimum fruit temperature. Shaded area represents the temperature spread. Heavy line - fruit temperature in the middle of the stack, quarterlength, centerline position in the car.

Figure 4.



Temperature comparison of sweet cherries during transit from Yakima Washington to New York, June 22 to July 1, 1942 in fan cars carrying heavy (1944 Boxes) and regular loads (1576 Boxes). Top line - maximum fruit temperature. Lower line - minimum fruit temperature. Shaded area represents temperature spread. Heavy line - fruit temperature in the middle of the stack, quarter length, centerline position in the car.

Figure 5.

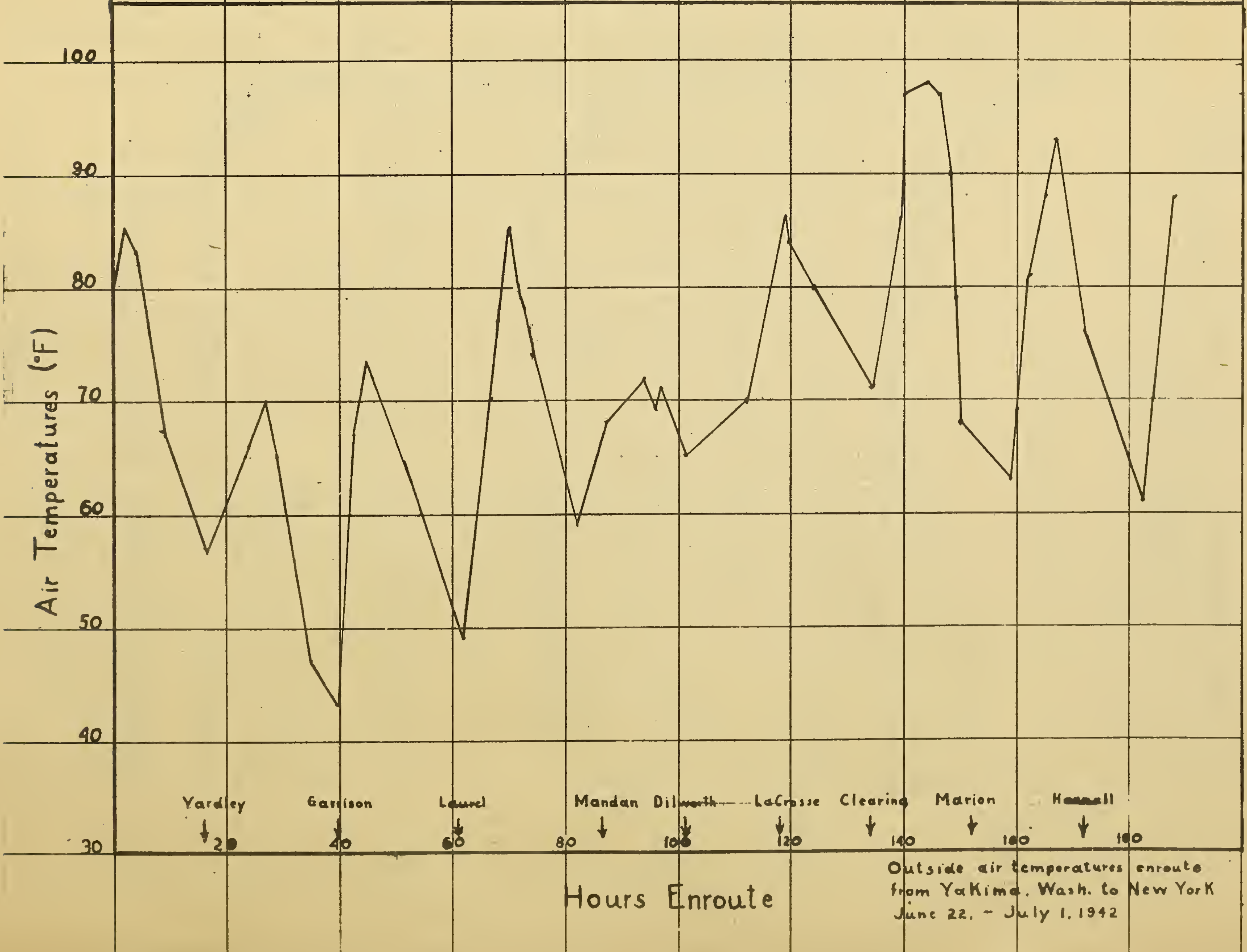
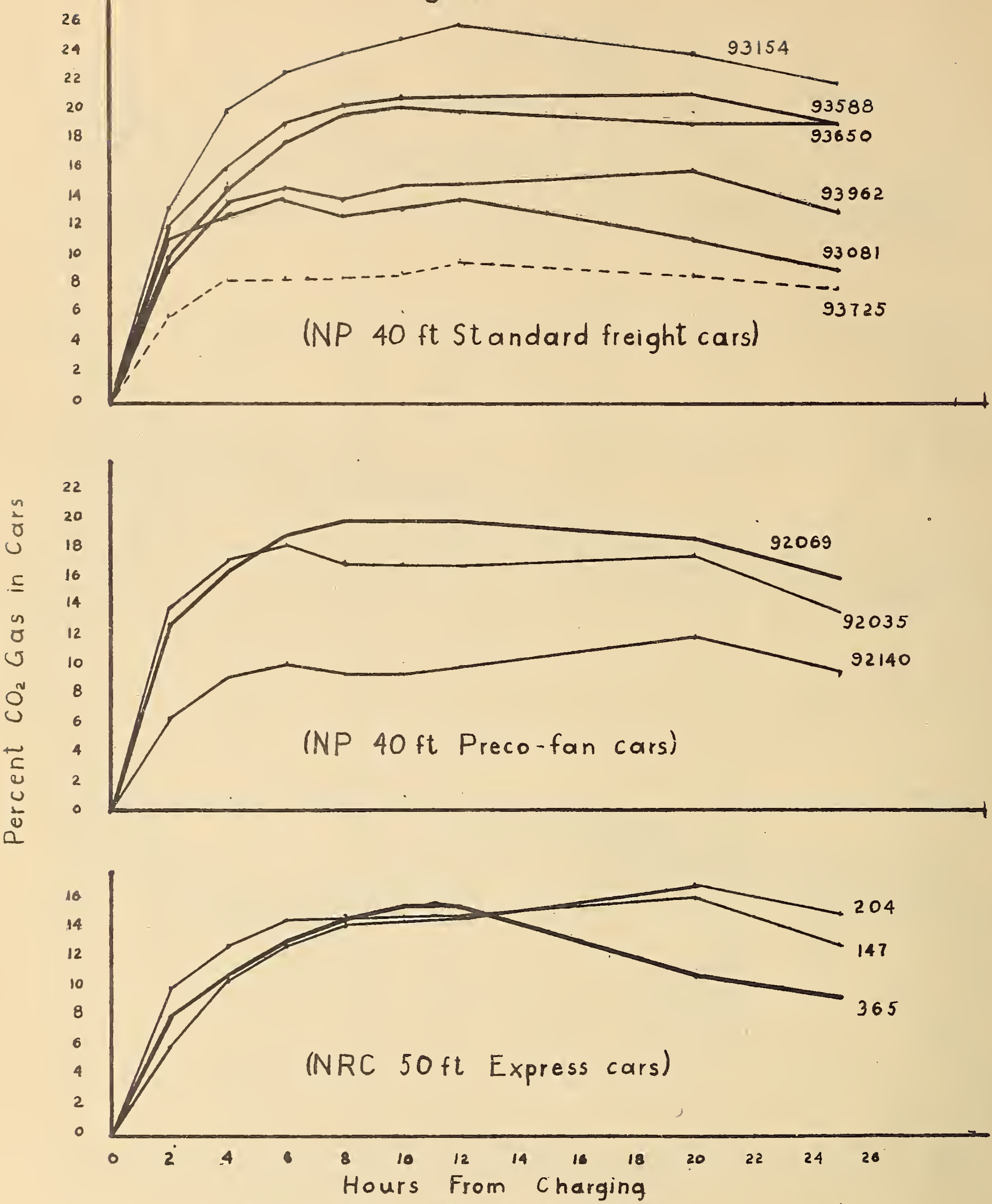
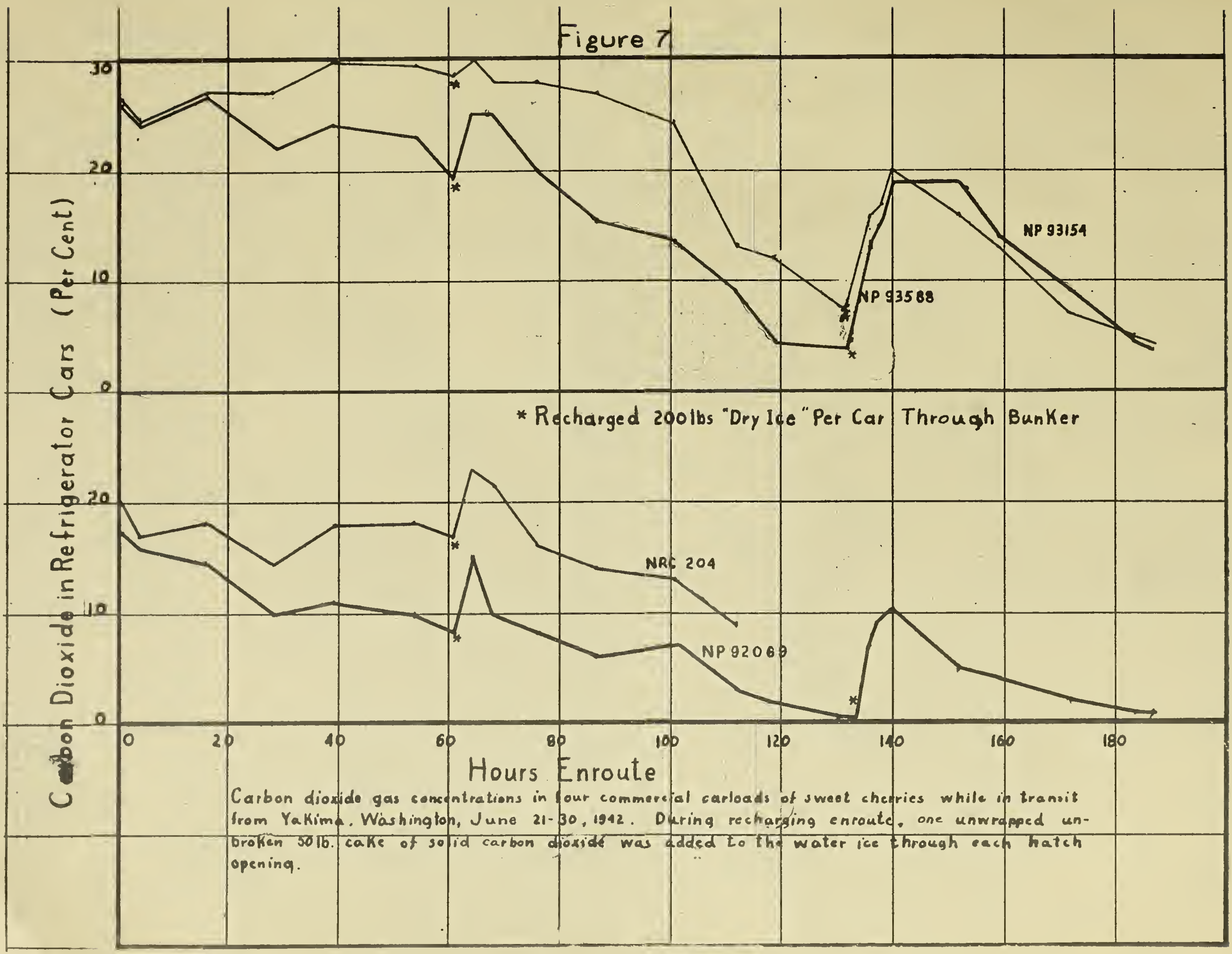

Air Temperatures (°F)
100
90
80
70
60
50
40
30
Yardley
Garrison
Laurel
Mandan
Dilworth
LaCrosse
Clearing
Marion
20
40
60
80
100
120
140
160
180
Hours Enroute
Outside air temperatures enroute from Yakima, Wash. to New York June 22. - July 1. 1942

Figure 6.



A standing test of the gas retentiveness of 12 uniced cars selected for apparent tightness. Yakima, Wash., June 16-17, 1942.

Figure 7



Carbon dioxide gas concentrations in four commercial carloads of sweet cherries while in transit from Yakima, Washington, June 21-30, 1942. During recharging enroute, one unwrapped unbroken 50 lb. cake of solid carbon dioxide was added to the water ice through each hatch opening.